

LAND SNAIL FAUNAS IN POLISH FORESTS: PATTERNS OF RICHNESS AND COMPOSITION IN A POST-GLACIAL LANDSCAPE

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ABSTRACT

We examine variation in species richness, species composition and distance decay in similarity in forest snail faunas from Poland and a small part of Transcarpathian Ukraine, and their connection with geographical position in relation to Pleistocene refugia. Forest faunas were sampled from sites of standard size in each of ten regions. Data were analysed using DCA and partial CCA, extracting the geographical, climatic and ecological correlates with the major axes. Relationships among site and regional faunas were further examined through the Simpson Index of Similarity. Site species richness shows no significant variation with geographical position or climate, but relates to soil and vegetation characteristics. Composition varies with location; southern highland faunas differ from one another far more than do northern lowland faunas, showing a clear east-to-west pattern of change. The aggregate highland fauna is richer than that of the lowlands, which is a subset of the former. Two intermediate upland regions show different associations, one with the highlands the other with the lowlands. Lowland faunas, even over large distances, are very similar, and all relate more closely to the western end of the highlands than to the east. Disaggregating the fauna into large and small species shows that the former show a stronger geographical pattern than the latter; most universally distributed species are small. Latitudinal variation in regional richness, and longitudinal differentiation among highland faunas relate to distance from glacial refugia. This is not reflected in site species richness, raising questions about the assembly rules for local faunas. The western bias in the relationships of lowland faunas to those of the highlands, the differences between large and small species and the varying rates of faunal turnover within the area studied suggest that patterns of post-glacial dispersal are complex and incompletely understood.

Key words: land snails, Poland, forests, Pleistocene refugia, species richness and composition.

INTRODUCTION

The fauna and flora of northern Europe, arctic-alpine relicts excepted, are mostly products of dispersal from more southerly refuges in the late Pleistocene/early Holocene. While refugia in the Iberian Peninsula, Italy and the Balkans were sources of many immigrants, the status of more northerly areas in Central Europe as refugia is now well attested (Willis et al., 2000; Stewart & Lister, 2001; Willis & Van Andel, 2004). Furthermore, patterns of tree dispersal suggest that the post-Pleistocene process of colonisation is not complete, and has not taken place at equal rates in all directions (Svenning & Skov, 2007; Svenning et al., 2008). Population genetics evidence suggests that range expan-

sion can come about by accidental long-range transport of propagules, a leptokurtic dispersal that can create discontinuous ranges despite continuous environmental suitability (Ibrahim et al., 1996; Hewitt & Ibrahim, 2001).

Hausdorf & Hennig (2003) showed that the land mollusc fauna of northern Europe has nested patterns that can be related to Alpine and Carpathian refugia. Lowland faunas to the north are subsets of the richer regional faunas to the south (Cameron, 2004). While there are a few forest-dwelling species that existed north of the mountain ranges through the last glaciation (Moine et al., 2008) and rather more that survived in the Hungarian Carpathian Basin, not far from the area north of the Carpathians in which our samples were made (Willis et al.,

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1995, 2000; Pokorný, 2002; Sümegi & Krolopp, 2002), most present-day forest faunas exist in places unoccupied by those species until approximately 10,000 BP or later. Although the western, alpine or eastern affinities of some species can be identified (Hausdorf & Hennig, 2003), there are many for which the origins are obscure, and northern faunas have accumulated from diverse sources (Waldén, 1986). There are many species with discontinuous ranges, not easily explained in terms of the present environment (Wiktor, 2004).

In this paper, we use data from forest sites in Poland and part of Transcarpathian Ukraine to examine the roles of dispersal and ecology in determining patterns of species richness, composition and faunal turnover in an area that covers a wide range of distances from possible sources.

MATERIAL AND METHODS

Samples of land snails were taken in 161 forest sites (149 in Poland, 12 in Transcarpathian Ukraine) between 2001 and 2007. Sites were located in clusters by geographical region, though these regions varied considerably in size. Figure 1 shows the locations of the regions (details of the locations of sites are given in Appendix 1). The Sudetes, Pieniny, southeastern Poland and Transcarpathian Ukraine regions are mountainous, and are regarded as highland regions. Kaszuby, Romnicka, Białowieża and Roztocze, in the Northern European Plain, are regarded as lowland. Ojców, at the southern end of the Kraków – Częstochowa upland, and Holy Cross (the isolated Góry Świętokrzyskie, reaching a maximum 695 m) are regarded as upland. Analyses of material from Białowieża and Kaszuby have been published elsewhere (Cameron & Pokryszko, 2004, 2006), but the data are included here.

Each site was selected to yield a fauna typical of its region, thus avoiding obvious gross disturbance or monoculture plantations. Each site, of approximately 400 m², was searched by two people for between one and two hours, and between 10 and 20 litres of litter were collected from the site and sieved. This variation in sampling effort was designed to ensure adequate numbers for inventory at each site (Cameron & Pokryszko, 2005). Methods of processing samples otherwise follow Cameron & Pokryszko (2004). Slugs are not included in our analyses; the sampling methods used

do not give reliable results for inventories. Nomenclature generally follows Wiktor (2004); exceptions are noted in Appendix 2.

Location and altitude were determined from maps, and climatic data from Hijmans et al. (2005). Apart from these continuous variables, ordinal scores were recorded for slope, amount of exposed rock or scree, of limestone substrate, of disturbance and of permanently waterlogged ground. Ordinal scores were also recorded for presence/dominance of tree species and field layer plants typical of particular soil conditions. Combinations of these scores were also used. The presence or absence of a stream or river, of large rotting timber, and of predominantly bare ground under the canopy were also recorded. In total, 35 geographical, climatic and environmental variables were used (Appendix 1, which also shows a PCA analysis of relationships between them).

The completeness of inventories was examined using the Chao 1 Estimator (Colwell & Coddington, 1994; Walther & Moore, 2005), using the number of species in each sample represented by one and by two individuals. The number of such species in each sample was very small (often zero), and the errors associated with the estimate in this situation are very large. Following Cameron & Pokryszko (2005) and Cameron et al. (2006), we have therefore taken the mean numbers of each per site by region to give an approximate indication of the number of species missing (data not shown). These estimates are very low, and show no relationship to the median sample size in each region. We have made no corrections to allow for missing species.

Most species in our array showed a unimodal response in ordination (showing a single mode in the mid range, rather than a linear response). We therefore used ordination techniques (Correspondence Analysis, Ter Braak & Prentice, 1988) based on such a response model (Lepš & Šmilauer, 2003). The species-by-sites matrix was analysed by Detrended Correspondence Analysis, DCA, (numbers transformed as $\log + 1$; rare species downweighted) to expose the major compositional gradients in the data. We chose an indirect gradient analysis (i.e. DCA) since our study is not hypothesis-testing research and no guarantee can be given that all relevant factors associated with each major compositional gradient have been measured (for details, see Økland, 1996). To explain the gradients in the species data, the correlations with geographical, climate, and environmental

variables were examined using Spearman correlations (r_s) with site scores on the first four DCA axes. The matrix of two-dimensional geographical coordinates was completed by adding all terms for a cubic trend surface regression and these nine parameters were used as descriptors of spatial structure (for details, see Borcard et al., 1992). To separate the independent variation caused by particular external factors (i.e., environment, climate, and space) we used the variation partitioning approach using separate Canonical Correspondence Analyses (partial CCAs) (Borcard et al., 1992). Details of the CCAs are given in Appendix 3 (Table 4). The CANOCO 4.5 package (Ter Braak & Šmilauer, 2002) was used for ordination techniques and STATISTICA 7 (Hill & Lewicki, 2007) for uni-dimensional analyses. Sequential Bonferroni corrections of the significance level were used for multiple comparisons of environmental variables (Holm, 1979).

Further analyses use Whittaker’s Index of Diversity for among site diversities within regions and the Simpson indices of similarity between regional faunas (Index 22 in Koleff et al., 2003: 370), using both the total inventory for each and mean site-by-site indices within each region. The Simpson Index counteracts the effects of different richness among sites, and enables variance estimates to be made. A Mantel test was used to detect spatial autocorrelation and distance decay, the rate of change in faunal composition with distance (Nekola & White, 1999).

RESULTS

The 161 sites produced a total of 86,191 individuals of 111 species (Appendix 2). Of these 111 species, 12 were found in only one site, and 10 were represented in the whole array by fewer than 10 individuals. While some of these can be regarded as rare forest species, others are typical of open and disturbed habitats. Nine species in this category (indicated in Appendix 2) have been eliminated from the array before analysis, which uses the remaining 102.

Species Richness

Table 1 shows the mean, median and the range of site species richness by region. There is considerable variation both among and within regions, but there are no significant relationships with either latitude or longitude, or with altitude. Only the environmental factors shown in Table 2 have significant effects. Those showing positive associations are themselves correlated. Table 2 also shows their combined effect, where only the combination of high scores over all factors produces a significant effect. The contrast between the two upland regions (Ojców and Holy Cross: Table 1) has an ecological cause; samples from Ojców are all from mixed forests on rocky limestone, while most of those from Holy Cross come from relatively small patches of partly deciduous forest in an area of acidic soils dominated by conifers. The only negative

TABLE 1. Basic data for the samples used in this study.

Region	No. of Samples	Mean Nos.	Median Nos.	Range Nos.	No. of Species	Mean per Sample	SD	Median	Range
Lowland									
Kaszuby	14	529	494	247–894	43	24.7	4.2	26	17–31
Romincka	12	830	766	474–1702	50	31.1	3.5	32.5	24–35
Białowieża	17	272	236	126–669	46	24.5	4.8	25	13–32
Roztocze	13	612	489	253–2257	52	22.9	3.5	22	18–29
Upland									
Holy Cross	6	357	371	178–543	38	19.0	3.7	18.5	15–25
Ojców	7	982	932	804–1247	44	36.4	2.0	37	33–39
Highland									
Sudetes	33	390	334	141–953	73	25.9	5.2	24	17–38
Pieniny	15	318	309	171–561	60	31.3	5.0	30	26–43
S.E. Poland	32	521	477	229–1018	71	30.8	4.8	31	21–43
Ukraine	12	307	284	77–774	44	25.8	4.2	26	16–31

TABLE 2. Mean site species richness in relation to environmental variables. In each case, 0, absent; 1, present but not abundant; 2, dominant or abundant. MDW: mixed deciduous woodland containing *Tilia*, *Fraxinus* or *Ulmus* and without a single dominant species. Rich: the occurrence of herbaceous plants indicating nutrient rich soil. Lime: limestone substrate at surface. Comb: the added scores for rocks, limestone, MDW and rich (maximum 8). Dist: 1 indicates evidence of recent disturbance. The overall mean for all sites is also given. *, **, ***, significant differences from the other categories at $P < 0.05$, 0.01 , 0.001 respectively.

	n	Mean	SD
Rocks			
2	31	30.9**	5.96
1	37	26.2	5.77
0	93	26.7	5.43
MDW			
2	67	28.6*	6.62
1	72	27.0	4.89
0	22	25.1	5.58
Comb			
7-8	13	35.6***	3.95
5-6	22	28.2	5.32
3-4	61	26.7	5.61
0-2	65	26.1	5.27
Lime			
2	27	31.0**	6.11
1	12	24.3	4.55
0	122	26.9	5.58
Rich			
2	32	32.1***	5.36
1	73	26.2	5.02
0	56	26.3	5.86
Dist			
1	39	25.7*	5.84
0	122	27.9	5.87
All	161	27.4	5.84

factor to achieve significance relates to disturbance, which was never extreme.

Composition: Site-by-Site Analyses

Figure 2 shows the distribution of sites on the first two axes of the DCA analysis, coded by region. It is evident that much of the varia-

tion in the data is among regions. The first axis separates the highland regions along an east-west axis, but with all lowland regions at the left end regardless of location; the second axis reflects a complex interaction of latitude, longitude and environment. There is a small overlap between the main lowland cluster and that of the Sudetes. Of the two upland areas, Ojców is in the highland sequence, and occupies an appropriate geographical position between the Sudetes and the Pieniny (Fig. 1). Holy Cross sites generally fall into the lowland cluster. Figure 2 also shows the relationships of the most significant environmental variables to the DCA axes (correlations among all explanatory variables and sites scores on the first four ordination axes are available in Appendix 3 (Table 1). DCA analysis based on presence and absence, CCA analysis, and PCoA analysis of presence and absence data, using site-by-site values of the Simpson Index of similarity (data not shown) produce very similar patterns; presence or absence of species accounts for most of the pattern observed. The clear regional grouping of sites implies a degree of spatial autocorrelation, or, reversing the emphasis, of distance decay in similarity, and an overall Mantel test on Simpson similarities in the whole array gives $r = 0.576$ ($P < 0.001$).

The independent effects of different categories of external variables were determined and tested by partial CCAs (details: Appendix 3, Table 4). The pure effect of location, independent of other variables, has a major influence on distribution of species. Hence, further analyses examine the geographical pattern in more detail.

Composition: Regional Analysis

There are clear differences in the amount of heterogeneity within regions. Table 3 demonstrates this, comparing values of Whittaker's Index, its variant I_{max} , and of the mean site-by-site Simpson Index for each region. The size of the region over which samples were taken is important, as is the range of forest types sampled in each. However, there is no clear geographical pattern within regions (data not shown), and in all regions the richest site contains more than half of all species we found in its region; we therefore use total regional faunas to explore patterns in more detail.

At the coarsest scale, there are clear differences between lowland and highland regions. Table 4 shows that while most species in the lowlands occur in at least three of the four

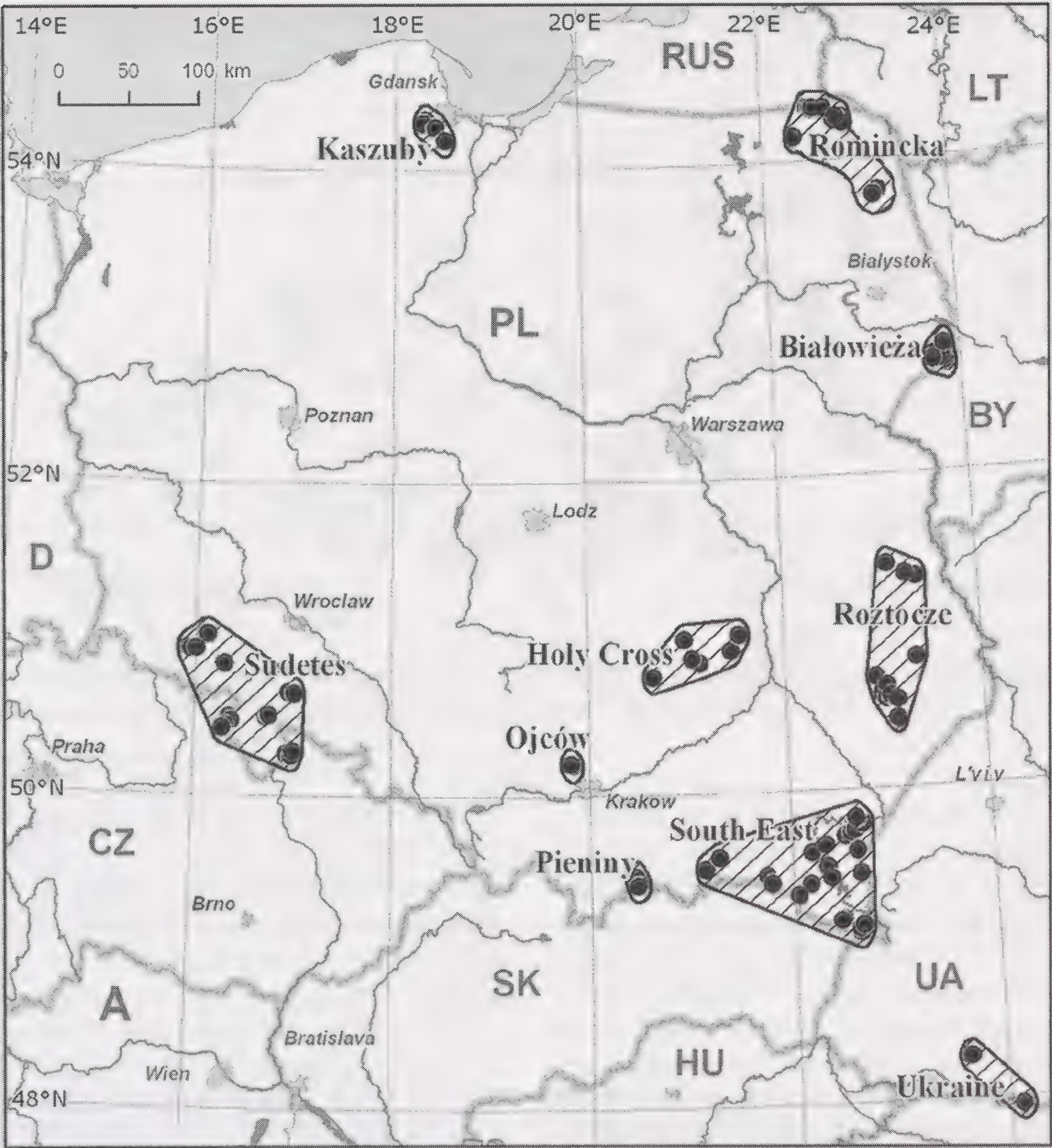


FIG. 1. Map showing the location and approximate size of regions within which samples were taken.

TABLE 3. Values of Whittaker's index, I_{max} , and mean site-by-site Simpson indices for each region. SE, Standard Error of the mean Simpson Index.

Region	No.	Whitt.	Whitt. max	Mean Simpson	SE
Kaszuby	14	1.74	1.39	0.81	0.010
Romincka	12	1.61	1.43	0.81	0.010
Białowieża	17	1.88	1.44	0.84	0.007
Roztocze	13	2.27	1.79	0.68	0.012
Holy Cross	6	2.00	1.52	0.71	0.031
Ojców	7	1.20	1.13	0.91	0.009
Sudetes	33	2.82	1.92	0.69	0.006
Pieniny	15	1.92	1.40	0.79	0.009
SE Poland	32	2.31	1.65	0.72	0.004
Ukraine	12	1.71	1.42	0.79	0.011

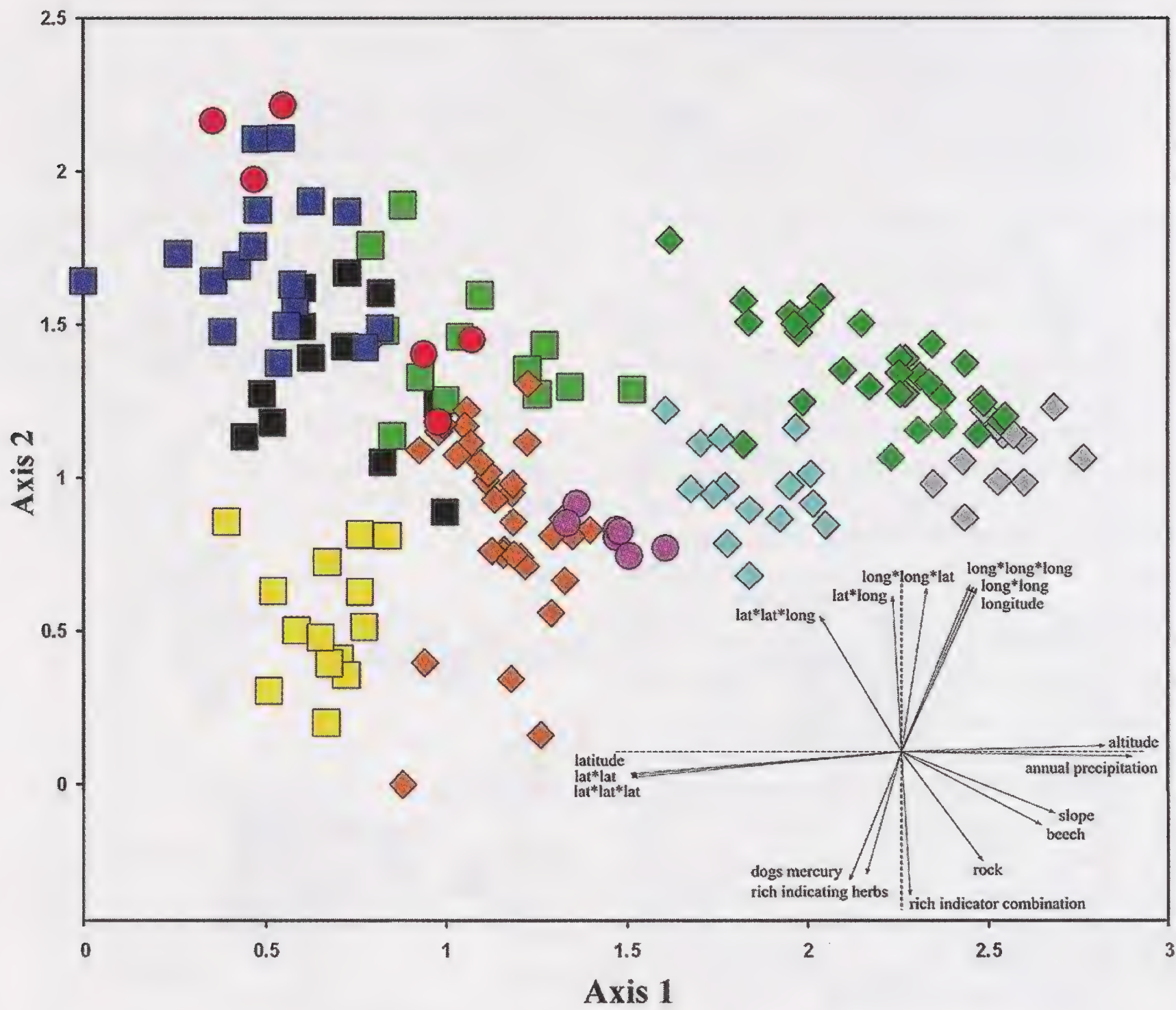
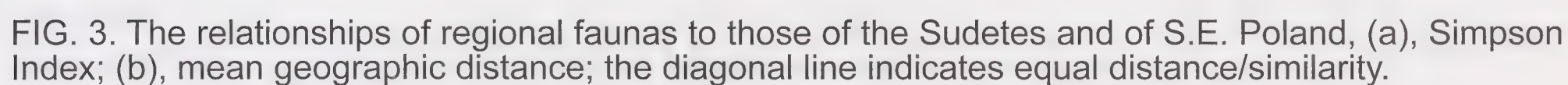


FIG. 2. Plots of site scores on the first two axes of a DCA, using log-transformed abundances. Explanatory variables significantly and highly correlated ($r_s > 0.5$) with the first two DCA axes are shown in the bottom right. Sites are coded by region. Diamonds, highland regions; circles, upland; squares, lowland. Black, Romincka; dark blue, Białowieża; light green, Roztocze; yellow, Kaszuby; red, Holy Cross; pink, Ojców; orange, Sudetes; pale blue, Pieniny; dark green, S.E. Poland; grey, Ukraine.

TABLE 4. Patterns of distribution of species among lowland, highland and upland regions. A: Species unique to each category. Unique in the lowland and highland columns takes no account of presence in either upland region. B: Numbers of species occupying 1, 2, 3, 4 regions within the category concerned. Highland widespread indicates species also present in one or more lowland regions.

A	Lowland	Highland	Highland ex Ukraine	Ojców	Holy Cross
No. of samples	56	92	80	7	6
Total species	64	97	93	44	38
Unique	3	36	32	1	1
% Unique	4.7	37.1	34.4	2.3	2.6
Not in Lowland				10 (23%)	3 (8%)
B	All Lowland	Highland widespread	Highland only	All Highland	
1 Region	10	8	16	24	
2 Regions	11	12	9	21	
3 Regions	13	18	8	26	
4 Regions	30	23	3	26	



At a finer grain, there are differences among regions. Table 5 shows among-region similarities using Simpson Indices for the whole fauna of each region. The four lowland regions show strong affinities with each other. They also show strong affinities to the Sudetes, and lower affinities to the other highland regions (Fig. 3). Kaszuby and Romincka have faunas that are little more than subsets of that of the Sudetes, although the latter is the furthest away from the Sudetes. Similarly, both upland regions relate more to the Sudetes than to other highland regions; this accords with geographical distance for Ojców, but not for Holy Cross. Within the highland regions, in contrast, similarity is clearly related to geographical distance.

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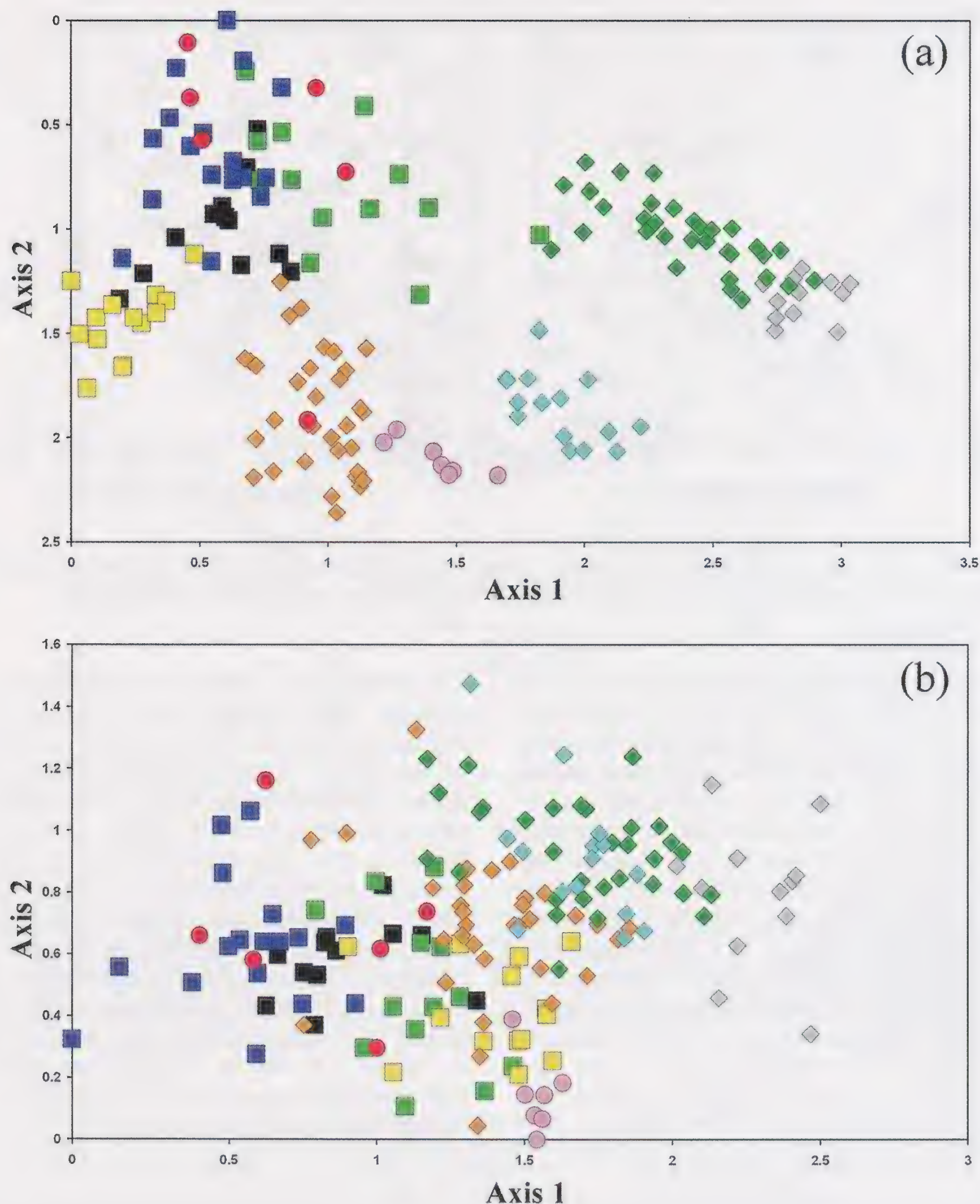


FIG. 4. Plots of site scores on the first two axes of a DCA using (a) large species and semislugs only, and (b) using small species only (see text). Symbols as in Fig. 2.

Although there is spatial autocorrelation overall (see above), these patterns indicate that the rate of distance decay in similarity varies greatly from any one region to others. The Simpson index between regional faunas shows only a weak association with distance ($r_s = -0.244$, $P > 0.1$) and this is largely an effect of Ukraine; without this region there is no connection with distance ($r_s = -0.04$, $P > 0.8$).

Composition: Species Analysis

Among the 102 species included in the analysis, 12 were recorded in all 10 regions while 16 were found only in one (Table 6). Examples of both widely and narrowly distributed species can be found in all those family or superfamily groupings with numerous species. Positions on the DCA biplot (not shown) reflect geographical

TABLE 6. Universal and unique species (by region). The first 10 universal species are also the most frequent by sites occupied. Asterisked species are small (see text). There were no species unique to Pieniny, Kaszuby, Romincka or Roztocze. For comment on *Vestia* sp. see Appendix 2.

Universal Species	Site Freq.	Regs	Unique Species	ukr	sep	sud	bia	ojc	hcr
* <i>Punctum pygmaeum</i>	159	10	<i>Vestia</i> sp.	X					
* <i>Carychium tridentatum</i>	152	10	<i>Mastus bielzi</i>	X					
* <i>Aegopinella pura</i>	148	10	<i>Drobacia banatica</i>	X					
* <i>Columella edentula</i>	133	10	<i>Acicula perpusilla</i>	X					
* <i>Acanthinula aculeata</i>	129	10	<i>Carpathica calophana</i>		X				
* <i>Vertigo pusilla</i>	126	10	<i>Trichia bakowskii</i>		X				
* <i>Euconulus fulvus</i>	125	10	<i>Pagodulina pagodula</i>		X				
<i>Cochlodina laminata</i>	123	10	<i>Eucobresia diaphana</i>			X			
<i>Vitrina pellucida</i>	120	10	<i>Causa holosericum</i>			X			
<i>Cochlicopa lubrica</i>	100	10	<i>Helicodonta obvoluta</i>			X			
* <i>Vitrea crystallina</i>	70	10	<i>Oxychilus draparnaudi</i>			X			
<i>Helix pomatia</i>	75	10	<i>Cochlodina costata</i>			X			
			<i>Cochlicopa nitens</i>				X		
			<i>Pyramidula pusilla</i>					X	
			<i>Vestia elata</i>						X

distribution. The only association with extent of distribution that we can detect is size. For purposes of analysis, we have followed Hausdorf & Hennig (2003) in taking the 26 species with maximum shell dimension less than 5 mm to be small, and regarding all others, including all semislugs, as large. Seven of the ten most frequent species by sites are small, as are eight out of the 12 found in all ten regions (Table 6). These proportions are significantly different from those in the remainder (χ^2 test, $P < 0.001$ in each case).

When sites are analysed by DCA using small and large species separately (Fig. 4, Appendix 3), the effects of size are manifest; for large species alone, sites in lowland regions cluster closely together, while the distinctions between them and highland regions, and among the highland regions are more marked than for the fauna as a whole (Fig. 2). In contrast, the pattern for small species is much less clear, with more overlap among regions. Only latitude, slope and precipitation show major relationships to the axes in the latter, and that for latitude is much weaker than for large species ($r_s = 0.69$, as compared with 0.90). Simpson Indices for small species alone are higher than those for the fauna as a whole; for some lowland comparisons, species compositions are identical (data not shown).

DISCUSSION

Five major findings emerge from our analyses:

- (1) The species richness of individual sites varies rather little, and relates to ecological conditions rather than geographical position.
- (2) Composition, however, relates to geography, in large part independently of present climate or other ecological constraints.
- (3) Highland regions are richer than lowland regions; the former are much closer to putative Pleistocene refugia.
- (4) Distance decay in similarity varies; lowland faunas are all very similar, and show a greater similarity to that of the Sudetes than to those of other highland regions further east, even when the latter are nearer. Highland regions are more differentiated.
- (5) Large species show more differentiation among regions than small species.

For site species richness, our results strengthen those of Pokryszko & Cameron (2005), who used less standardised data over a larger area. At the scale of small sites, forest snail faunas show no pronounced change in richness with latitude. Site faunas from England or southern Sweden are as rich as those 600 km or more

to the south (Waldén, 1981; Cameron et al., 2006). While comparable data are sparse, the relative stability of species richness in forest sites across Europe stands in sharp contrast to the strong latitudinal trend for overall regional species richness within the continent (Cameron, 2004). Only in the far north (above 60°), where forest types are very restricted, or in the far east, in the southern Urals, very far from any refugia and with a more extreme climate (Horsák et al., in press), is local richness significantly lower. Distance from putative refugia has little effect on local richness within the limits of our study area. This contrast in pattern between regional and local richness might indicate that local, biotic interactions are limiting local richness independently of the regional pool (Srivastava, 1999). However, Hillebrand (2005) has warned against any simplistic interpretation of such relationships, and since snail faunas often include many restricted endemics and snails have poor powers of active dispersal, the concept of a regional fauna in this context is hard to define: what is actually available at site *x*? Evidence for interspecific competition in land snails is sparse and mainly confined to examples of closely related or similar-sized species, usually in rather stressed environments with limited faunas (Solem, 1984; Baur & Baur, 1990; Cameron et al., 2003). The classic scepticism of Boycott (1934) about the role of competition in structuring snail faunas has not been refuted. Nevertheless, our study emphasises the relative invariance of site species richness in forest snail faunas across many climatic and biogeographic regions (Stanisic et al., 2007), in contrast to many other organisms (Ricklefs, 2004).

In contrast, regional richness and composition are clearly related to geographical position. There is a coherent pattern of differentiation along the Sudetes-Carpathian chain. Inevitably, more unique species are found at either end of this transect than at the centre; the Sudetes support species with Alpine affinities, whereas Ukraine has species of Balkan affinities. Ukrainian faunas are the most distinct, and come from the only region in our study to lie south of the mountain chain crest. Given the strong showing of purely geographical factors in the partition of variance, this pattern appears to be a product of distances from diverse refugia to the south, east and west. Hausdorf & Henning (2003) detected foci of nestedness in the eastern Alps and in the Carpathians. There are, however, numerous forest species that are spread across the ranges (and into the

lowlands). The evidence that forests persisted throughout the last glaciation in areas just south of our study area has become overwhelming (Willis et al., 2000; Willis & Van Andel, 2004; Birks & Willis, 2008). Both palaeobotanical and palaeomalacological data show that even at the glacial maximum there was a zone of forests consisting of larch, pine, and spruce in the Carpathians (Jankovská & Pokorný, 2008; Kuneš et al., 2008). Ložek (2006) confirmed that between the loess steppe belt at the foot of the south side of the Carpathians and the zone of alpine grasslands a zone of montane to subalpine woodlands at 600–1,600 m a.s.l. persisted during the glacial period. He found in the sediments of this zone a mixture of glacial open-country elements and several woodland species that are considered characteristic of warm interglacial periods. Sümegi & Krolopp (2002) similarly reported the occurrence in the Carpathian basin of species now found in some of our sites. In Bohemia, however, the region immediately south of the Sudetes, there is no evidence of the survival of such forests or the snail faunas that accompanied them (Ložek, 2006). Although the many studies within our area reveal only open-country faunas north of the Carpathian watershed before approximately 11,000 BP (Alexandrowicz, 2004), it is evident that dispersal into developing Holocene forests could involve shorter distances, over a wider front, than previously thought.

In contrast, lowland faunas are less differentiated, and contain a higher proportion of widespread species, many ranging across the whole Northern European Plain (Pokryszko & Cameron, 2005; Horsák et al., in press). That they form subsets of those in the highlands conforms to the findings of Hausdorf & Henning (2003). The novel feature here, however, is the stronger relationship to the fauna of the Sudetes than to those of regions further east, to the extent that measures of differentiation among faunas show little relationship to distance. Many species found in the Carpathians have failed to move north, despite apparently suitable habitats. Mountains in the Sudetes, and in the neighbouring western Beskids, are generally lower than those further east, perhaps offering fewer barriers to the dispersal of (generally low altitude) forest species. What is clear, however, is that Holocene dispersal across the Polish lowlands has not been uniform in speed or direction. A western bias in source of colonisation has also been reported for early-colonising trees (Kullman, 2002). Within the highlands, species with limited ranges

contribute to a rapid rate of turnover. Hausdorf & Hennig (2004) found little evidence for vicariance in the Northern European snail fauna, but evidence from elsewhere (Weir, 2006) suggests that highland faunas may differentiate by isolation caused by climatic change more readily than those in lowlands.

These findings, coupled with the evidence that small species have dispersed more rapidly than large ones, raise questions about the role and mechanics of dispersal in shaping the present faunas. This wider distribution of small species can be further linked with their ability to survive under cold conditions. We see no differences between the small number of large species that have spread over most of the area, and those that remain confined to highlands close to earlier refuges. Within the lowland and upland faunas, there are cases of disjunct distributions, sometimes involving gaps of 200 km or more (Wiktor, 2004). Thus *Chilostoma faustinum*, found along the mountain chain, is found in the lowlands in Roztocze, which is nearby, and also in Romincka (Marzec, 2005), which is the most distant region, but not in Białowieża, which lies in between. *Vestia elata* and *Balea fallax*, both generally restricted Carpathian species, are known from single sites in the Holy Cross and Roztocze respectively. *Ena montana*, not found in any of our lowland regions, is recorded even further north in Latvia and Lithuania (Skujienė, 2002).

We can identify possible mechanisms to account for some of these patterns. The central belt of Poland is more fertile than the far north, and far more intensively cultivated. Thus, disjunct distributions can result from destruction of populations in the middle of ranges (Cameron & Pokryszko, 2006). Humans can act as long-distance dispersal agents; this is well documented for a few species (e.g., Ożgo, 2005), but is probably not a significant feature for forest faunas. Climate was neither stable nor continuously warming through the Holocene (Walker, 1995), and expansions and contractions of ranges in response can leave isolated relicts in favoured locations. In this context, the occurrence of *Semilimax kotulae* and *Vestia elata* in the Holy Cross region, and of many highland species at Ojców is significant. While we cannot dismiss the possibility that these processes account for such discontinuous distributions, there is a further mechanism, the long-distance dispersal of propagules, which could produce similar patterns (Ibrahim et al., 1996; Hewitt & Ibrahim, 2001). Certainly, there are cases in which isolated occurrences of some large

species (e.g., *Ena montana* mentioned above) do not relate only to a demonstrable refuge. We cannot assume a stable balance; sites in parts of the previously glaciated or periglacial areas north of the European mountain ranges may be “full”, but others may still be open to colonisation, a process now hindered by human intervention (Giesecke et al., 2007; Svenning et al., 2008).

As Nekola & White (1999) demonstrated, analyses of distance decay require consideration of differences in dispersal ability and environmental tolerance. The mechanisms of dispersal and the constraints on successful establishment in land snails remain to be determined.

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APPENDIX 1

Environmental and locality data

TABLE 1. Descriptive statistics for explanatory variables used in the analyses. Wet indicator combination: wet, alder/willow, wet indicating herbs. Rich indicator combination: rock, limestone, mixed deciduous wood, ash, dog's mercury, rich indicating herbs, timber. Poor indicator combination: conifers, acid indicating herbs, bare ground.

	Mini- mum	Lower quartile	Mean	Median	Upper quartile	Maximum
Environment						
Rock	0.0	0.0	0.6	0.0	1.0	2.0
Limestone	0.0	0.0	0.4	0.0	0.0	2.0
Slope	0.0	0.0	1.0	1.0	2.0	2.0
Wet	0.0	0.0	0.6	0.0	1.0	2.0
Disturbance	0.0	0.0	0.3	0.0	0.0	2.0
Conifers	0.0	0.0	0.5	0.0	1.0	2.0

(continues)

(continued)

	Mini- mum	Lower quartile	Mean	Median	Upper quartile	Maximum
Beech	0.0	0.0	0.8	1.0	2.0	2.0
Mixed deciduous wood	0.0	1.0	1.3	1.0	2.0	2.0
Alder/willow	0.0	0.0	0.6	0.0	1.0	2.0
Ash	0.0	0.0	0.3	0.0	1.0	2.0
Wet indicating herbs	0.0	0.0	0.4	0.0	1.0	2.0
Dog's mercury	0.0	0.0	0.7	1.0	1.0	2.0
Rich indicating herbs	0.0	0.0	0.9	1.0	1.0	2.0
Acid indicating herbs	0.0	0.0	0.3	0.0	1.0	2.0
Altitude	80.0	175.0	341.6	290.0	470.0	780.0
Wet indicator combination	0.0	0.0	1.5	1.0	2.0	6.0
Rich indicator combination	1.0	3.0	5.4	5.0	7.0	13.0
Poor indicator combination	0.0	1.0	1.7	2.0	2.0	5.0
Climate						
Mean Annual Temp. (°C)	4.3	6.1	6.6	6.7	7.1	8.0
Mean Max. Temp. Warmest Month	17.7	21.3	21.9	22.1	22.8	23.9
Mean Min. Temp. Coldest Month	-9.9	-8.6	-7.9	-8.0	-7.5	-5.4
Annual Precipitation (mm)	515.0	583.0	674.0	659.0	765.0	854.0
Coefficient of variation, seasonal precipitation	30.0	33.0	37.4	37.0	41.0	49.0
Space						
Latitude	47.9	49.5	50.9	50.5	52.7	54.3
Longitude	15.9	18.4	20.8	21.8	23.0	24.1
Nominal Environmental						
Stream	0.0	0.0	0.6	1.0	1.0	1.0
Timber	0.0	0.0	0.3	0.0	1.0	1.0
Bare	0.0	0.0	0.3	0.0	1.0	1.0

→

TABLE 2. PCA of all explanatory variables in the 161 forests sites. In total, 35 geographical, climatic and environmental variables were used and they were subjected to principal components analysis (PCA) of the correlation matrix (centred and standardised) to show the main gradients of their variation and the relationships among individual variables. Eigenvalues of axes (in parentheses), Spearman correlations of continuous and ordinal variables with the first four PCA axes (r_s) and their significances (P) are shown. Significant correlations after Bonferroni correction are in bold (the cut level was $P = 0.0016$). Mann-Whitney U test was used for testing relationships between nominal variables and sites scores on the PCA axes. Significant relationships ($P = 0.05$) are in bold.

Continuous and ordinal	PCA1		PCA2		PCA3		PCA4	
	(0.257)		(0.186)		(0.111)		(0.086)	
	r _s	P	r _s	P	r _s	P	r _s	P
Environment								
Rock	-0.80	<0.001	-0.18	0.020	-0.18	0.021	-0.10	0.199
Limestone	-0.53	<0.001	-0.20	0.011	-0.25	<0.001	-0.24	0.002
Slope	-0.63	<0.001	-0.42	<0.001	-0.10	0.197	-0.05	0.560
Wet	0.60	<0.001	0.19	0.018	0.53	<0.001	-0.22	0.004
Disturbance	0.03	0.734	-0.07	0.400	-0.25	<0.001	-0.14	0.068
Conifers	0.51	<0.001	0.13	0.097	0.05	0.506	0.30	<0.001
Beech	-0.44	<0.001	-0.56	<0.001	-0.04	0.591	0.30	<0.001
Mixed deciduous wood	-0.12	0.132	0.54	<0.001	-0.27	<0.001	-0.20	0.011
Alder/willow	0.49	<0.001	0.26	<0.001	0.49	<0.001	-0.36	<0.001
Ash	0.15	0.055	0.16	0.042	0.01	0.972	-0.49	<0.001
Wet indicating herbs	0.39	<0.001	-0.16	0.041	0.54	<0.001	-0.43	<0.001
Dog’s mercury	-0.47	<0.001	0.49	<0.001	-0.29	<0.001	-0.16	0.043
Rich indicating herbs	-0.34	<0.001	0.36	<0.001	-0.44	<0.001	-0.08	0.286
Acid indicating herbs	0.23	0.003	-0.11	0.169	0.06	0.471	0.42	<0.001
Altitude	-0.55	<0.001	-0.64	<0.001	0.28	<0.001	-0.01	0.937
Wet indicator combination	0.57	<0.001	0.17	0.033	0.59	<0.001	-0.36	<0.001
Rich indicator combination	-0.60	<0.001	0.38	<0.001	-0.42	<0.001	-0.25	<0.001
Poor indicator combination	-0.01	0.943	-0.47	<0.001	-0.01	0.887	0.62	<0.001
Climate								
Mean Annual Temp. (°C)	-0.07	0.387	0.01	0.908	-0.50	<0.001	-0.50	<0.001
Mean Max. Temp. Warmest Month	0.27	<0.001	-0.20	0.011	-0.48	<0.001	-0.43	<0.001
Mean Min. Temp. Coldest Month	-0.18	0.024	0.70	<0.001	-0.20	0.011	0.00	0.953
Annual Precipitation (mm)	-0.40	<0.001	-0.67	<0.001	0.26	<0.001	0.02	0.791
Coefficient of variation, seasonal precipitation	-0.63	<0.001	-0.09	0.278	0.03	0.665	-0.28	<0.001
Space								
Latitude	0.38	<0.001	0.81	<0.001	-0.12	0.124	0.25	<0.001
Longitude	0.71	<0.001	-0.48	<0.001	-0.34	<0.001	-0.10	0.227
Lat.*Long.	0.83	<0.001	-0.31	<0.001	-0.34	<0.001	-0.06	0.463
Lat.*Lat.	0.38	<0.001	0.81	<0.001	-0.12	0.124	0.25	<0.001
Long.*Long.	0.71	<0.001	-0.48	<0.001	-0.34	<0.001	-0.10	0.227
Lat.*Lat.*Long.	0.88	<0.001	-0.15	0.063	-0.31	<0.001	0.01	0.870
Lat.*Long.*Long.	0.79	<0.001	-0.36	<0.001	-0.35	<0.001	-0.08	0.285
Lat.*Lat.*Lat	0.38	<0.001	0.81	<0.001	-0.12	0.124	0.25	<0.001
Long.*Long.*Long.	0.71	<0.001	-0.48	<0.001	-0.34	<0.001	-0.10	0.227
Nominal (P values)								
PCA1 PCA2 PCA3 PCA4								
Environment								
Stream	0.355	0.590	<0.001	0.735				
Timber	0.330	0.035	0.078	0.102				
Bare	0.027	<0.001	0.288	<0.001				

TABLE 3. Locations and environmental scores for all sites used in analysis. Regional grouping of sites: Rom & Aug, Romincka; Roz & Pol, Roztocze; Rad, Kol & Tra, Kaszuby; Mus, Mys, Bar, Ksi, Mly, Mil & Sto, Sudetes; Bia, Białowieża; Kuz & Ugo, Ukraine; Bie, San, Prz, Ust, Kom, Rym & Gor, S.E. Poland; Pod & Pie, Pieniny; Hcr, Holy Cross; Ojc, Ojców. Climatic data from Hijmans et al. (2005).

	rock	lime	slop	stre	wet	timb	bare	distur	conl	bee	mdw	aldwil	ash	weth	dogsm	richh	acidl	alt	wetcom	richco	poorco	MeanAnnTem	MaxTemWarMon	MinTemColMon	AnnPrec	PrecSeanCV	latitude	long
Rom1	0	0	0	1	2	0	0	0	1	0	2	1	1	1	1	0	0	150	4	5	1	6.1	21.5	-8.4	659	31	54.343	22.498
Rom2	0	0	0	0	1	0	0	0	1	0	2	0	1	0	1	1	1	150	1	6	2	6.1	21.6	-8.3	655	31	54.34	22.512
Rom3	0	0	0	0	1	0	0	0	0	0	2	0	0	0	2	2	0	150	1	7	0	6.1	21.6	-8.3	655	31	54.342	22.519
Rom4	0	0	0	1	2	1	0	0	1	0	2	2	1	1	1	1	0	150	5	7	1	6.2	21.6	-8.3	645	32	54.33	22.548
Rom5	0	0	0	1	1	1	1	0	0	0	2	2	1	1	2	1	0	150	4	8	0	6.2	21.7	-8.2	645	32	54.34	22.545
Rom6	0	0	0	1	1	0	0	0	0	0	1	2	0	1	1	0	0	150	4	3	0	6.3	21.7	-8.1	643	32	54.338	22.568
Rom7	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	0	210	1	5	1	5.8	21.5	-8.9	665	31	54.159	22.351
Rom8	0	0	2	1	0	1	0	0	1	0	2	0	0	0	0	2	0	210	0	6	1	6.0	21.7	-8.7	659	31	54.156	22.351
Rom9	0	0	1	1	1	0	0	0	1	0	0	1	0	0	1	0	1	160	2	2	2	5.9	21.3	-8.4	643	32	54.331	22.704
Rom10	0	0	1	1	1	0	0	0	1	0	1	1	0	0	1	1	0	160	2	4	1	6.1	21.6	-8.2	637	32	54.338	22.686
Aug1	0	0	0	1	2	1	0	0	1	0	1	2	1	1	1	2	1	125	5	7	2	6.5	22.3	-7.9	580	33	53.799	23.236
Aug2	0	0	0	0	1	0	0	0	1	0	1	1	0	0	0	0	0	125	2	2	1	6.5	22.4	-8.0	580	33	53.771	23.177
Roz1	0	0	2	1	0	0	1	0	1	2	1	0	0	0	0	2	0	260	0	4	3	7.1	22.8	-8.2	580	41	50.704	22.916
Roz2	0	0	1	0	0	0	1	0	2	2	0	0	0	0	0	0	1	290	0	1	5	7.2	22.9	-8.1	579	41	50.594	22.959
Roz3	0	0	0	0	2	0	0	0	1	1	0	1	0	1	0	0	1	250	4	1	3	7.3	22.8	-8.0	583	41	50.559	23.008
Roz4	1	1	2	1	1	0	0	2	0	0	1	2	0	1	0	0	1	260	4	4	1	7.3	22.8	-7.6	588	40	50.441	23.108
Roz5	0	0	0	0	0	0	0	0	0	1	2	0	0	0	1	1	1	260	0	5	2	7.0	22.5	-8.3	586	41	50.647	23.027
Roz6	0	0	0	0	0	0	0	0	0	1	2	0	0	0	1	1	1	280	0	5	2	7.0	22.6	-8.2	586	41	50.646	23.021
Roz7	0	0	1	0	0	0	0	0	1	1	1	0	1	0	1	1	0	290	0	5	2	6.7	22.1	-8.3	606	41	50.573	23.053
Roz8	0	0	1	0	0	0	1	0	1	1	0	0	0	0	0	1	1	300	0	2	3	7.2	22.7	-8.0	583	41	50.584	23.052

(continues)

[illegible]

	rock	lime	slop	stre	wet	timb	bare	distur	coni	bee	mdw	aldwil	ash	weth	dogsm	richh	acids	alt	wetcom	richco	poorco	MeanAnnTem	MaxTemWarMon	MinTemColMon	AnnPrec	PrecSeanCV	latitude	long
Mus4	0	1	0	1	1	0	0	0	0	0	1	2	1	0	1	1	0	270	3	6	0	7.8	22.6	-5.4	583	45	50.661	16.995
Mys1	1	0	2	1	0	0	0	0	0	0	2	0	0	0	1	1	1	270	0	6	1	7.1	22.4	-7.5	631	39	51.016	16.12
Mys2	2	0	2	1	0	1	0	0	0	0	2	0	0	0	2	2	0	270	0	10	0	7.0	22.1	-7.7	644	38	51.02	16.1
Mys3	1	0	2	1	0	0	0	0	0	0	2	0	0	0	1	1	1	270	0	6	1	7.0	22.1	-7.7	644	38	51.022	16.09
Mys4	2	0	2	1	0	0	0	0	0	0	2	0	0	0	2	1	1	270	0	8	1	7.3	22.7	-7.4	624	39	51.023	16.11
Mys5	1	0	1	1	0	1	0	0	0	0	2	0	0	0	2	1	1	270	0	8	1	7.3	22.7	-7.4	624	39	51.025	16.12
Bar1	1	0	1	0	0	0	0	0	0	0	2	0	0	0	2	0	0	300	0	6	0	7.8	22.7	-5.5	575	49	50.503	16.74
Bar2	1	0	1	1	0	1	0	0	0	0	2	0	0	0	2	1	0	250	0	8	0	7.4	22.0	-5.7	598	48	50.5	16.73
Bar3	2	0	2	0	0	0	0	0	0	0	2	0	0	0	2	1	0	250	0	8	0	7.4	22.0	-5.7	598	48	50.509	16.75
Bar4	2	0	2	0	0	0	0	1	0	0	2	0	0	0	1	0	0	250	0	6	0	7.4	22.0	-5.7	598	48	50.51	16.75
Bar5	1	0	2	1	0	1	0	1	0	0	2	1	0	0	2	0	0	250	1	7	0	7.9	22.6	-5.5	574	48	50.51	16.76
Ksi1	2	0	2	1	0	0	1	0	0	1	2	0	0	0	2	2	0	310	0	9	1	7.3	22.4	-7.0	617	42	50.845	16.291
Ksi2	2	0	2	1	0	0	1	0	0	2	1	0	0	0	1	2	0	310	0	7	2	7.3	22.4	-7.0	617	42	50.843	16.291
Ksi3	2	0	2	1	0	0	1	0	0	1	2	0	0	0	0	2	0	310	0	7	1	6.8	21.7	-7.3	649	41	50.839	16.29
Ksi4	2	0	2	1	0	0	0	0	0	1	2	0	0	0	1	2	0	310	0	8	1	6.9	21.7	-7.3	644	42	50.838	16.299
Mly1	1	0	1	1	0	0	0	0	1	0	1	0	0	0	1	0	1	780	0	4	2	4.7	18.3	-7.6	765	40	50.273	16.932
Mly2	0	0	0	1	1	0	0	0	1	0	1	0	0	1	0	0	1	740	2	2	2	4.8	18.3	-7.6	765	40	50.27	16.937
Mly3	1	0	0	1	1	0	0	0	1	0	1	0	1	1	0	0	1	650	2	4	2	4.3	17.7	-7.9	793	39	50.267	16.942
Mly4	0	0	0	1	0	0	1	1	1	2	1	1	0	0	0	1	2	780	1	3	5	4.6	18.2	-7.7	776	40	50.256	16.989
Mly5	1	0	1	0	1	0	1	1	1	1	1	1	0	1	0	1	1	690	3	4	3	5.4	19.1	-7.1	731	41	50.28	17.001
Mil1	2	2	0	0	0	0	0	0	0	2	0	0	0	0	2	1	0	400	0	8	2	6.6	21.6	-8.2	670	38	50.943	15.935

(continues)

(continued)

	rock	lime	slop	stre	wet	timb	bare	distur	coni	bee	mdw	aldwil	ash	weth	dogsm	richh	acidh	alt	wetcom	richco	poorco	MeanAnnTem	MaxTemWarMon	MinTemCollMon	AnnPrec	PrecSeanCV	latitude	long
Mil2	2	2	1	0	0	1	0	0	0	2	1	0	1	0	2	1	0	560	0	11	2	6.1	20.7	-8.2	704	36	50.937	15.938
Mi3	1	2	1	0	0	0	1	1	0	2	1	0	1	0	0	1	0	420	0	7	2	6.7	21.7	-8.1	670	38	50.939	15.918
Mil4	2	2	2	0	0	0	1	2	0	2	1	0	0	0	0	1	0	510	0	7	2	6.0	20.5	-8.3	714	36	50.937	15.909
Mil5	2	2	2	0	0	0	1	2	0	1	1	0	0	0	2	0	0	460	0	8	1	6.3	21.1	-8.3	687	37	50.931	15.947
Mil6	1	2	1	1	1	1	0	1	0	1	2	1	1	0	1	1	0	550	2	10	1	5.8	20.1	-8.3	723	36	50.929	16.002
Sto1	2	2	2	0	0	0	0	0	0	2	1	0	0	0	2	1	0	730	0	9	2	5.2	18.9	-7.7	745	39	50.498	16.35
Sto2	1	0	2	1	0	0	0	0	1	1	2	1	0	1	1	1	0	590	2	6	2	5.4	19.3	-7.5	727	41	50.477	16.372
Sto3	0	0	0	1	2	0	0	0	0	0	0	2	0	2	0	1	0	550	6	2	0	6.3	20.5	-7.0	679	43	50.446	16.309
Sto4	0	0	0	1	1	0	0	0	0	0	2	1	0	2	1	1	0	450	4	5	0	6.6	21.0	-6.8	656	44	50.429	16.287
Bia2	0	0	0	0	0	1	1	0	2	0	1	0	0	0	0	0	2	155	0	3	4	6.9	23.2	-7.8	582	32	52.696	23.816
Bia5	0	0	0	1	1	0	0	1	1	0	1	2	1	1	1	0	0	155	4	4	1	7.0	23.3	-7.7	580	31	52.701	23.815
Bia9	0	0	0	0	0	1	0	0	1	0	2	0	0	0	0	1	1	175	0	5	2	6.9	23.1	-7.8	583	31	52.7	23.794
Bia11	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	2	170	0	2	3	6.9	23.2	-7.8	582	32	52.672	23.849
Bia12	0	0	0	1	1	0	0	0	1	0	1	2	1	1	0	0	1	160	4	3	2	7.0	23.3	-7.7	580	31	52.688	23.827
Bia13	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	1	0	170	0	4	1	6.9	23.2	-7.8	581	31	52.706	23.791
Bia16	0	0	0	0	0	1	0	0	1	0	2	0	0	0	0	2	0	165	0	6	1	7.0	23.2	-7.7	581	31	52.711	23.787
Bia1	0	0	0	0	0	0	1	1	1	0	2	0	0	0	0	1	0	165	0	4	1	7.0	23.2	-7.7	580	31	52.725	23.779
Bia4	0	0	0	1	2	0	0	0	1	0	1	2	0	1	0	1	0	157	5	3	1	7.0	23.2	-7.7	581	31	52.719	23.715
Bia10	0	0	0	0	0	1	0	0	1	0	2	0	0	0	0	1	1	162	0	5	2	6.9	23.2	-7.7	581	31	52.734	23.716
Bia14	0	0	0	1	1	0	0	0	1	0	1	2	1	1	1	1	0	150	4	5	1	7.1	23.3	-7.6	578	31	52.716	23.817
Bia15	0	0	0	1	2	0	0	0	1	0	0	2	0	1	0	0	0	150	5	1	1	7.1	23.3	-7.6	578	31	52.713	23.818

	rock	lime	slop	stre	wet	timb	bare	distur	coni	bee	mdw	aldwil	ash	weth	dogsm	richh	acidh	alt	wetcom	richco	poorco	MeanAnnTem	MaxTemWarMon	MinTemColMon	AnnPrec	PrecSeanCV	latitude	long
Bia3	0	0	0	1	2	0	0	0	1	0	0	2	1	1	0	0	0	150	5	2	1	7.0	23.3	-7.7	580	31	52.707	23.823
Bia17	0	0	0	0	1	0	0	0	2	0	1	0	0	1	0	0	2	175	2	2	4	6.9	23.1	-7.8	583	31	52.7	23.797
Bia6	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	1	165	0	2	2	6.9	23.2	-7.8	581	31	52.706	23.799
Bia7	0	0	0	1	1	0	0	1	1	0	1	1	1	1	0	1	0	145	3	4	1	7.0	23.3	-7.7	578	30	52.8	23.826
Bia8	0	0	0	0	0	1	0	0	1	0	2	0	0	0	0	1	0	175	0	5	1	6.9	23.2	-7.7	581	31	52.702	23.702
Kuz1	2	2	1	1	1	0	0	0	1	2	1	0	0	1	1	2	0	560	2	9	3	6.9	22.3	-8.4	770	36	47.945	24.123
Kuz2	2	2	2	1	0	0	0	0	0	2	1	0	0	1	1	1	0	530	1	8	2	6.9	22.3	-8.4	770	36	47.944	24.12
Kuz3	2	2	2	1	0	0	0	0	0	2	1	0	0	0	1	1	0	510	0	8	2	6.5	21.7	-8.7	787	36	47.942	24.116
Kuz4	2	2	1	1	0	0	1	0	0	2	1	1	0	0	1	1	0	480	1	8	2	7.3	22.8	-8.2	757	35	47.94	24.114
Kuz5	2	1	1	1	0	0	0	0	0	2	1	0	0	0	1	1	0	440	0	7	2	7.3	22.8	-8.2	757	35	47.938	24.11
Ugo1	2	1	2	1	0	0	1	0	0	2	1	0	0	0	0	0	1	550	0	5	3	5.9	20.7	-8.5	841	33	48.261	23.646
Ugo2	1	1	1	1	0	1	1	0	0	2	0	0	0	0	0	0	1	540	0	4	3	5.9	20.7	-8.5	841	33	48.259	23.642
Ugo3	1	1	1	1	0	1	1	0	0	2	0	0	0	0	0	0	1	525	0	4	3	6.7	21.9	-8.0	808	32	48.259	23.636
Ugo4	1	1	2	1	0	1	0	0	0	2	1	0	0	0	1	1	1	520	0	7	3	7.6	23.0	-7.5	780	31	48.257	23.628
Ugo5	2	2	2	1	0	0	1	0	0	2	1	0	0	0	1	1	0	500	0	8	2	7.7	23.1	-7.4	778	31	48.256	23.623
Ugo6	2	2	2	1	0	0	1	0	0	2	1	0	0	0	0	0	0	520	0	6	2	7.6	23.0	-7.5	780	31	48.258	23.63
Ugo7	1	1	2	1	0	0	1	0	0	2	0	0	0	0	0	0	0	545	0	3	2	5.9	20.7	-8.5	841	33	48.26	23.644
Bie1	0	0	2	1	0	0	1	1	0	2	1	0	0	0	0	0	0	760	0	2	2	5.9	20.9	-9.1	745	38	49.605	22.64
Bie2	0	0	2	1	0	0	1	1	0	2	1	0	0	0	0	0	0	760	0	2	2	5.3	20.2	-9.3	834	33	49.081	22.64
Bie3	0	0	0	1	2	0	0	0	0	0	0	2	1	2	0	0	0	650	6	2	0	5.9	21.0	-8.9	799	33	49.113	22.663
Bie4	0	0	0	1	1	0	0	0	1	0	2	2	1	1	0	0	0	640	4	4	1	6.0	21.1	-8.9	794	33	49.126	22.673

CAMERON ET AL.

	rock	lime	slop	stre	wet	timb	bare	distur	coni	bee	mdw	aldwil	ash	weth	dogsm	richh	acidh	alt	wetcom	richco	poorco	MeanAnnTem	MaxTemWarMon	MinTemColMon	AnnPrec	PrecSeanCV	latitude	long
Bie5	0	0	2	0	0	1	1	0	0	2	1	1	0	0	2	1	0	650	1	6	2	5.5	20.5	-9.2	823	33	49.119	22.66
Bie6	0	0	2	1	0	1	1	0	0	2	0	0	0	0	1	0	0	710	0	3	2	4.8	19.7	-9.9	854	33	49.172	22.476
Bie7	0	0	0	1	2	0	0	1	1	0	1	2	0	2	0	0	0	610	6	2	1	5.8	21.1	-9.3	797	33	49.162	22.457
Bie8	0	0	0	1	2	0	0	0	1	0	1	2	0	2	0	0	0	660	6	2	1	5.6	20.7	-9.1	815	33	49.105	22.632
Bie9	0	0	1	0	1	0	1	0	0	2	1	0	0	0	1	0	0	640	1	3	2	6.0	21.1	-8.9	794	33	49.126	22.67
San1	1	0	2	1	1	0	0	0	0	2	1	0	0	0	0	1	1	200	1	4	3	7.0	23.0	-9.1	670	38	49.605	22.239
San2	0	0	1	1	1	1	0	0	0	1	2	1	0	1	0	1	0	200	3	5	1	6.7	22.6	-9.4	687	37	49.607	22.188
San3	0	0	1	0	1	0	0	1	0	0	2	0	1	1	0	1	0	210	2	5	0	6.5	22.4	-9.6	696	37	49.603	22.183
San4	0	0	2	1	1	0	0	0	0	1	1	1	1	1	0	0	1	290	3	3	2	6.3	21.9	-9.5	703	38	49.648	22.326
San5	0	0	2	1	1	0	1	0	1	1	1	0	1	1	0	1	1	250	2	4	3	6.8	22.6	-9.3	686	36	49.503	22.33
San6	0	0	1	0	1	0	0	0	0	1	2	0	1	1	0	1	1	280	2	5	2	6.7	22.5	-9.2	690	37	49.509	22.337
San7	0	0	2	1	0	0	0	0	1	1	1	0	0	1	0	0	1	350	1	2	3	6.0	21.6	-9.8	731	36	49.438	22.373
Prz1	0	0	0	1	1	0	0	1	0	1	1	1	0	1	0	0	0	350	3	2	1	6.7	22.0	-8.6	689	39	49.701	22.525
Prz2	0	0	0	1	1	0	0	1	0	1	2	1	1	1	0	1	1	400	3	5	2	6.8	21.9	-8.3	690	40	49.719	22.586
Prz3	0	0	1	1	0	1	0	1	0	0	2	1	0	0	0	0	1	250	1	4	1	7.6	22.9	-7.5	650	40	49.736	22.622
Prz4	0	0	1	1	0	0	0	0	0	1	2	0	1	0	1	2	0	200	0	7	1	7.5	22.6	-7.3	660	40	49.774	22.7
Prz5	0	0	1	1	1	0	0	0	1	1	2	1	1	1	0	1	0	200	3	5	2	8.0	23.3	-7.0	631	41	49.805	22.652
Prz6	0	0	0	1	1	0	0	0	1	1	2	1	1	1	1	1	0	220	3	6	2	7.5	22.8	-7.5	652	41	49.815	22.639
Ust1	0	0	0	1	2	0	0	1	0	0	1	2	1	2	0	1	0	400	6	4	0	6.5	21.7	-8.5	721	37	49.458	22.661
Kom1	0	0	1	1	0	0	1	0	1	1	2	0	0	0	1	1	0	410	0	5	2	5.9	21.5	-9.9	752	35	49.402	22.167
Kom2	0	0	1	0	1	1	0	1	0	0	2	1	0	1	0	1	0	500	3	5	0	6.0	21.7	-9.6	770	34	49.322	22.052

	rock	lime	slop	stre	wet	timb	bare	distur	conl	bee	mdw	aldwil	ash	weth	dogsm	richh	acidl	alt	wetcom	richco	poorco	MeanAnnTem	MaxTemWarMon	MinTemColMon	AnnPrec	PrecSeanCV	latitude	long
Kom3	0	0	2	1	1	1	0	1	0	1	1	1	1	2	0	0	1	500	4	4	2	5.9	21.4	-9.7	773	34	49.331	22.043
Rym1	1	0	2	1	1	0	0	0	1	1	2	0	0	1	0	0	0	380	2	4	2	6.6	22.5	-9.1	743	37	49.463	21.731
Rym2	1	0	2	1	1	0	0	0	1	1	2	1	1	1	0	1	0	380	3	6	2	6.7	22.7	-9.0	734	36	49.462	21.737
Rym3	0	0	2	1	1	1	0	2	1	1	1	2	0	2	0	0	1	480	5	3	3	6.1	21.8	-9.4	771	36	49.412	21.781
Gor1	1	0	2	0	1	0	1	1	0	1	1	1	0	0	0	0	0	400	2	3	1	6.8	22.7	-8.5	787	38	49.515	21.134
Gor2	1	0	2	1	0	0	1	1	0	1	1	1	0	0	0	0	0	400	1	3	1	6.8	22.7	-8.5	787	38	49.512	21.135
Gor3	0	0	2	1	1	0	0	1	0	1	1	1	0	1	0	0	0	400	3	2	1	6.8	22.7	-8.6	774	38	49.587	21.272
Pod1	1	0	2	0	0	1	1	0	0	2	0	0	0	0	0	1	0	650	0	4	2	6.2	21.8	-9.0	804	44	49.457	20.443
Pod2	1	0	2	0	0	1	1	0	0	2	0	0	0	0	0	1	0	570	0	4	2	6.7	22.4	-8.8	776	45	49.461	20.441
Pod3	1	0	1	0	0	0	1	0	0	2	1	0	0	0	0	2	0	520	0	5	2	6.7	22.4	-8.8	776	45	49.464	20.438
Pod4	1	0	2	1	0	1	1	0	0	2	1	0	0	0	0	1	0	440	0	5	2	7.2	23.0	-8.5	747	45	49.47	20.434
Pod5	1	0	2	1	0	0	1	0	0	2	0	0	0	0	0	0	0	440	0	2	2	7.2	23.0	-8.5	747	45	49.468	20.435
Pod6	1	0	1	1	0	1	1	0	0	2	0	0	0	1	0	0	1	440	0	3	3	7.2	23.0	-8.5	747	45	49.475	20.439
Pod7	1	0	1	1	1	0	1	0	1	2	0	0	0	1	0	0	0	450	1	2	3	6.5	22.0	-8.9	795	45	49.477	20.439
Pod8	1	0	1	1	0	0	1	0	1	2	1	0	0	0	0	1	1	450	0	4	3	6.5	22.0	-8.9	795	45	49.478	20.44
Pie1	2	2	2	0	0	1	0	0	0	1	2	0	1	0	2	2	0	470	0	13	1	6.6	22.3	-8.8	767	45	49.424	20.467
Pie2	1	2	2	0	0	0	0	0	1	1	2	0	2	0	2	2	0	470	0	12	2	6.6	22.3	-8.8	767	45	49.425	20.47
Pie3	1	2	1	0	0	0	0	0	1	0	2	0	0	0	2	2	0	470	0	10	1	6.6	22.3	-8.8	767	45	49.425	20.473
Pie4	1	2	1	0	0	0	0	1	0	0	2	0	1	0	2	2	0	470	0	11	0	6.7	22.3	-8.7	766	45	49.424	20.477
Pie5	2	2	2	0	0	0	0	1	0	0	2	0	1	0	2	2	0	470	0	12	0	6.7	22.3	-8.7	766	45	49.424	20.481
Pie6	1	2	1	1	1	0	0	1	2	2	0	0	0	1	1	0	0	470	2	5	4	7.4	23.4	-8.5	724	46	49.419	20.458

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	rock	lime	slop	stre	wet	timb	bare	distur	coni	bee	mdw	aldwil	ash	weth	dogsm	richh	acidh	alt	wetcom	richco	poorco	MeanAnnTem	MaxTemWarMon	MinTemColMon	AnnPrec	PrecSeanCV	latitude	long
Pie7	2	2	2	1	0	0	0	1	2	0	1	0	1	1	0	0	0	490	1	7	2	7.4	23.4	-8.3	722	46	49.421	20.463
Hcr1	0	0	1	1	1	0	0	0	1	0	1	1	0	0	0	0	1	250	2	2	2	6.8	22.3	-8.6	627	40	50.983	20.98
Hcr2	0	0	0	1	1	0	0	0	1	1	0	1	0	0	0	0	1	380	2	1	3	6.6	22.0	-8.7	652	40	50.832	21.129
Hcr3	0	0	0	0	2	0	0	0	1	0	0	2	0	2	0	0	0	260	6	1	1	7.2	22.8	-8.6	631	41	50.746	20.654
Hcr4	0	0	1	1	0	0	0	0	0	0	2	0	0	0	0	0	1	200	0	3	1	7.9	23.6	-7.3	564	41	50.905	21.449
Hcr5	1	1	2	1	0	0	0	1	0	1	2	1	0	0	1	0	0	180	1	6	1	8.0	23.7	-7.3	550	42	51.005	21.538
Hcr6	1	0	1	0	1	0	0	0	1	1	1	0	0	0	0	1	1	550	1	4	3	5.8	20.9	-9.4	707	40	50.858	21.052
Ojc1	2	2	2	0	0	0	0	0	0	2	1	0	0	0	2	2	0	370	0	10	2	6.9	21.7	-7.6	766	41	50.203	19.81
Ojc2	2	2	2	0	0	0	0	0	0	2	1	0	1	0	2	2	0	390	0	11	2	6.9	21.7	-7.6	766	41	50.205	19.809
Ojc3	2	2	2	0	0	0	1	0	0	2	1	0	1	0	2	2	0	350	0	11	2	7.2	22.1	-7.5	745	41	50.188	19.826
Ojc4	2	2	2	0	0	1	1	0	0	2	1	0	0	0	2	2	0	350	0	11	2	7.2	22.1	-7.5	745	41	50.189	19.829
Ojc5	2	2	2	0	0	1	0	0	1	2	2	0	0	0	2	2	0	350	0	12	3	7.5	22.5	-7.2	715	41	50.195	19.826
Ojc6	2	2	2	0	1	0	0	0	0	2	2	0	0	1	2	2	0	400	2	11	2	6.9	21.8	-7.6	765	41	50.204	19.806
Ojc7	2	2	2	0	0	1	0	0	0	2	1	0	0	0	2	2	0	400	0	11	2	6.9	21.7	-7.6	766	41	50.201	19.811

APPENDIX 2
Species/Sites matrix and taxonomic notes

Nomenclature follows Wiktor (2004), except for asterisked species: *Acicula perpusilla* (Reinhardt, 1880), *Pyramidula pusilla* (Vallot, 1801) Syn: *P. rupestris*, *Sphyradium doliolum* (Bruguière, 1792) Syn: *Orcula doliolum*, *Vestia* sp.: a *Vestia* as yet undetermined, but not any of those also recorded in our samples; *Trochulus* (all species), in Wiktor (2004) as *Trichia*; the latter name has prior use elsewhere. The following species were excluded from the analyses (see text): *Oxyloma elegans*, *Succinea sarsi*, *Columella aspera*, *Truncatellina cylindrica*, *Vertigo angustior*, *Chondrina clienta*, *Oxychilus inopinatus*, *Cepaea vindobonensis*, *Helix lutescens*.

	Romincka											
	Rom 1	Rom 2	Rom 3	Rom 4	Rom 5	Rom 6	Rom 7	Rom 8	Rom 9	Rom 10	Aug 1	Aug 2
<i>Acicula parcelineata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Acicula polita</i>	8	0	2	0	0	0	1	4	0	0	2	4
* <i>Acicula perpusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carychium minimum</i>	23	9	0	14	6	10	0	11	0	0	5	12
<i>Carychium tridentatum</i>	272	84	151	0	341	41	33	42	28	43	94	178
<i>Succinea oblonga</i>	0	0	0	539	1	0	4	0	0	0	0	14
<i>Succinea putris</i>	12	6	5	0	24	23	0	2	11	5	12	23
<i>Cochlicopa lubrica</i>	41	49	6	139	77	142	16	20	5	21	8	8
<i>Cochlicopa lubricella</i>	0	0	0	0	0	0	0	0	0	0	0	6
<i>Cochlicopa nitens</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Pyramidula pusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Columella edentula</i>	38	38	14	50	14	24	0	12	14	10	24	11
<i>Vertigo pusilla</i>	7	31	9	6	6	2	5	10	27	5	59	34
<i>Vertigo antivertigo</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vertigo substriata</i>	17	45	15	10	2	0	8	2	10	7	36	16
<i>Vertigo alpestris</i>	0	17	1	64	3	1	3	6	32	0	1	0
* <i>Sphyradium doliolum</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Pagodulina pagodula</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Argna bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vallonia costata</i>	19	2	0	64	0	9	0	0	0	2	3	0
<i>Vallonia pulchella</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Acanthinula aculeata</i>	29	18	45	66	7	0	32	7	0	7	21	15
* <i>Mastus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ena montana</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ena obscura</i>	1	0	3	26	0	20	8	2	0	0	0	0
<i>Punctum pygmaeum</i>	124	53	159	394	365	12	49	43	42	29	330	136
<i>Discus ruderatus</i>	0	56	0	6	10	6	0	4	22	6	17	13
<i>Discus rotundatus</i>	26	32	8	5	16	0	14	20	2	22	0	0
<i>Discus perspectivus</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrina pellucida</i>	28	5	0	23	13	15	16	11	2	0	4	20
<i>Semilimax semilimax</i>	0	0	0	0	0	0	0	0	0	0	0	0

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	Romincka											
	Rom 1	Rom 2	Rom 3	Rom 4	Rom 5	Rom 6	Rom 7	Rom 8	Rom 9	Rom 10	Aug 1	Aug 2
<i>Semilimax kotulae</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia diaphana</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia nivalis</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea diaphana</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea transsylvanica</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea crystallina</i>	28	19	8	84	29	36	0	5	4	9	2	1
<i>Vitrea contracta</i>	0	0	0	0	0	0	4	0	0	0	0	0
<i>Aegopinella pura</i>	75	55	42	150	33	38	15	14	18	26	8	28
<i>Aegopinella minor</i>	27	0	9	0	0	0	11	20	0	0	0	0
<i>Aegopinella epipedostoma</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Aegopinella nitidula</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Nesovitrea hammonis</i>	18	45	1	33	8	23	3	5	15	22	15	17
<i>Nesovitrea petronella</i>	24	54	2	20	23	0	0	0	5	19	24	2
<i>Oxychilus alliarius</i>	1	0	0	0	0	0	0	0	0	0	1	0
<i>Oxychilus cellarius</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus deubeli</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus draparnaudi</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus glaber</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus depressus</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Daudebardia rufa</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Daudebardia brevipes</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carpathica calophana</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Zonitoides nitidus</i>	2	0	0	17	18	3	0	0	0	0	3	4
<i>Euconulus fulvus</i>	29	48	8	31	6	2	3	10	11	14	26	10
<i>Euconulus alderi</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina laminata</i>	7	36	14	27	57	12	75	85	84	90	27	27
<i>Cochlodina costata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina orthostoma</i>	0	0	0	0	39	0	55	30	0	0	12	11
<i>Ruthenica filograna</i>	0	0	0	59	25	18	21	3	0	3	8	0
<i>Macrogastra ventricosa</i>	22	31	13	54	128	57	45	124	0	0	6	11
<i>Macrogastra latestriata</i>	0	0	4	0	0	0	1	0	0	0	5	8
<i>Macrogastra plicatula</i>	15	61	4	83	43	71	60	127	69	78	44	2
<i>Macrogastra tumida</i>	31	20	4	0	0	0	0	0	0	0	0	0
<i>Clausilia parvula</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia dubia</i>	1	2	0	6	133	26	19	0	12	53	0	1
<i>Clausilia pumila</i>	0	0	0	0	3	0	0	0	0	0	9	37
<i>Clausilia cruciata</i>	7	22	23	25	31	10	0	0	54	0	18	13
<i>Clausilia bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0

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	Romincka										Aug 1	Aug 2
	Rom 1	Rom 2	Rom 3	Rom 4	Rom 5	Rom 6	Rom 7	Rom 8	Rom 9	Rom 10		
<i>Laciniaria plicata</i>	2	32	35	0	0	0	17	24	0	0	0	49
<i>Alinda biplicata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea fallax</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea stabilis</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Vestia</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vestia gulo</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vestia turgida</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vestia elata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bulgarica cana</i>	6	23	20	25	111	0	69	70	0	0	21	68
<i>Bradybaena fruticum</i>	26	3	4	33	12	51	0	0	24	2	15	26
<i>Perforatella bidentata</i>	34	3	3	25	58	12	0	4	0	3	37	27
<i>Perforatella dibothrion</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella incarnata</i>	0	0	0	0	0	0	0	0	0	0	8	0
<i>Perforatella vicina</i>	0	0	0	0	0	0	28	77	0	0	0	0
<i>Perforatella umbrosa</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella rubiginosa</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus villosulus</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus hispidus</i>	56	0	3	4	8	33	11	64	4	36	0	0
* <i>Trochulus lubomirskii</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bakowskii</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus unidentatus</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Euomphalia strigella</i>	0	0	0	0	0	2	2	1	0	0	0	0
<i>Helicodonta obvoluta</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helicigona lapicida</i>	0	0	2	0	0	0	0	4	0	0	0	0
<i>Arianta arbustorum</i>	7	0	5	6	10	26	0	0	23	29	0	0
<i>Causa holosericum</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chilostoma faustinum</i>	0	0	0	1	0	0	0	0	0	0	0	0
<i>Drobacia banaticum</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Isognomostoma isognomostoma</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cepaea hortensis</i>	7	1	3	7	9	8	8	9	25	14	2	14
<i>Cepaea nemoralis</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helix pomatia</i>	0	0	0	0	0	1	0	0	0	0	0	0

	Roztocze												
	Roz 1	Roz 2	Roz 3	Roz 4	Roz 5	Roz 6	Roz 7	Roz 8	Roz 9	Roz 10	Pol 1	Pol 2	Pol 3
<i>Acicula parcelineata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Acicula polita</i>	19	0	35	0	5	5	2	0	0	19	8	11	0
* <i>Acicula perpusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carychium minimum</i>	0	0	77	0	0	0	0	62	2	0	7	35	0
<i>Carychium tridentatum</i>	113	17	21	33	32	62	76	85	122	130	41	22	65
<i>Succinea oblonga</i>	0	0	0	0	0	0	1	0	0	0	0	0	99
<i>Succinea putris</i>	0	0	3	2	0	0	0	0	2	0	20	1	0
<i>Cochlicopa lubrica</i>	0	0	53	9	0	2	3	3	7	13	2	29	33
<i>Cochlicopa lubricella</i>	0	0	0	0	0	0	0	0	1	0	0	0	176
<i>Cochlicopa nitens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Pyramidula pusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Columella edentula</i>	18	12	28	6	0	3	27	9	9	10	2	2	92
<i>Vertigo pusilla</i>	15	32	12	26	83	127	16	3	31	60	5	9	121
<i>Vertigo antivertigo</i>	0	0	6	0	0	0	0	0	0	0	0	0	0
<i>Vertigo substriata</i>	0	0	37	0	0	0	2	98	0	2	0	0	3
<i>Vertigo alpestris</i>	0	25	0	2	0	53	0	56	0	1	0	0	0
* <i>Sphyradium doliolum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Pagodulina pagodula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Argna bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vallonia costata</i>	0	0	12	7	0	0	0	0	2	0	0	0	800
<i>Vallonia pulchella</i>	0	0	0	0	0	0	0	0	0	0	0	13	0
<i>Acanthinula aculeata</i>	16	17	14	0	49	2	4	6	0	4	17	3	5
* <i>Mastus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ena montana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ena obscura</i>	0	0	0	0	0	0	3	0	2	0	0	44	47
<i>Punctum pygmaeum</i>	58	51	33	20	87	22	15	13	60	43	136	77	102
<i>Discus ruderatus</i>	0	15	0	1	72	7	0	27	6	0	0	2	0
<i>Discus rotundatus</i>	23	45	0	34	27	60	115	15	0	76	0	0	3
<i>Discus perspectivus</i>	0	0	0	0	0	7	0	0	0	0	0	0	0
<i>Vitrina pellucida</i>	0	1	4	20	7	15	13	2	3	22	113	23	111
<i>Semilimax semilimax</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Semilimax kotulae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia diaphana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia nivalis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea diaphana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea transsylvanica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea crystallina</i>	12	2	11	0	0	0	2	0	0	16	12	0	3
<i>Vitrea contracta</i>	0	0	0	0	34	0	0	7	2	0	0	0	0
<i>Aegopinella pura</i>	18	9	58	0	70	8	7	2	4	65	11	8	54

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(continued)

	Roztocze												
	Roz 1	Roz 2	Roz 3	Roz 4	Roz 5	Roz 6	Roz 7	Roz 8	Roz 9	Roz 10	Pol 1	Pol 2	Pol 3
<i>Aegopinella minor</i>	17	4	0	0	71	4	3	0	6	2	11	34	0
<i>Aegopinella epipedostoma</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Aegopinella nitidula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Nesovitrea hammonis</i>	13	8	0	6	21	0	5	18	14	17	18	4	44
<i>Nesovitrea petronella</i>	0	0	0	0	0	0	0	0	2	0	0	0	0
<i>Oxychilus alliarius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus cellarius</i>	0	0	0	0	0	2	0	0	0	0	0	0	0
<i>Oxychilus deubeli</i>	4	0	0	8	0	0	0	0	0	0	0	0	0
<i>Oxychilus draparnaudi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus glaber</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus depressus</i>	0	0	0	0	0	0	0	0	0	5	0	0	0
<i>Daudebardia rufa</i>	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Daudebardia brevipes</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carpathica calophana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Zonitoides nitidus</i>	0	0	27	0	0	0	0	0	0	0	0	20	25
<i>Euconulus fulvus</i>	14	14	13	0	23	25	4	23	5	27	4	6	8
<i>Euconulus alderi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina laminata</i>	6	7	0	0	7	29	24	17	36	14	37	74	97
<i>Cochlodina costata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina orthostoma</i>	0	0	0	0	0	0	0	0	0	0	0	2	0
<i>Ruthenica filograna</i>	0	0	0	0	0	0	0	0	0	0	0	0	117
<i>Macrogastra ventricosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Macrogastra latestriata</i>	4	4	0	0	20	42	43	29	0	1	0	1	0
<i>Macrogastra plicatula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Macrogastra tumida</i>	0	1	0	0	17	1	11	0	0	0	0	0	0
<i>Clausilia parvula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia dubia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia pumila</i>	0	0	0	0	2	0	1	0	0	0	0	0	232
<i>Clausilia cruciata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Laciniaria plicata</i>	3	0	0	0	0	0	64	1	99	0	0	25	0
<i>Alinda biplicata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea fallax</i>	70	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea stabilis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Vestia</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0

(continues)

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	Roztocze												
	Roz 1	Roz 2	Roz 3	Roz 4	Roz 5	Roz 6	Roz 7	Roz 8	Roz 9	Roz 10	Pol 1	Pol 2	Pol 3
<i>Vestia gulo</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vestia turgida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vestia elata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bulgarica cana</i>	3	0	0	0	0	3	59	9	0	0	0	65	0
<i>Bradybaena fruticum</i>	11	0	8	23	0	5	15	0	9	3	4	19	20
<i>Perforatella bidentata</i>	0	0	5	0	0	0	0	0	0	0	5	27	0
<i>Perforatella dibothrion</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella incarnata</i>	21	4	5	15	12	5	7	9	0	11	0	0	0
<i>Perforatella vicina</i>	27	0	0	27	15	0	24	0	0	22	54	0	0
<i>Perforatella umbrosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella rubiginosa</i>	0	0	0	0	0	0	0	0	0	0	0	9	0
* <i>Trochulus villosulus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus hispidus</i>	0	0	0	11	0	0	0	0	27	0	1	128	0
* <i>Trochulus lubomirskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bakowskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus unidentatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Euomphalia strigella</i>	17	0	0	3	13	0	0	0	5	0	3	37	0
<i>Helicodonta obvoluta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helicigona lapicida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Arianta arbustorum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Causa holosericum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chilostoma faustinum</i>	5	0	0	0	0	0	0	0	0	0	0	0	0
<i>Drobacia banaticum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Isognomostoma isognomostoma</i>	2	3	0	0	0	0	9	0	0	39	0	0	0
<i>Cepaea hortensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cepaea nemoralis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helix pomatia</i>	0	0	12	0	0	0	0	0	18	23	0	24	0

	Sudetes (a)														
	Mus	Mus	Mus	Mus	Mys	Mys	Mys	Mys	Mys	Bar	Bar	Bar	Bar	Bar	
	1	2	3	4	1	2	3	4	5	1	2	3	4	5	
<i>Acicula parcelineata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Acicula polita</i>	40	12	6	2	0	2	0	0	0	1	0	0	0	0	
<i>*Acicula perpusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Carychium minimum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Carychium tridentatum</i>	145	105	136	43	2	97	1	134	222	2	1	0	210	706	
<i>Succinea oblonga</i>	0	0	0	0	0	0	0	0	0	0	0	0	3	4	
<i>Succinea putris</i>	0	0	0	0	0	0	0	0	0	2	0	0	0	2	
<i>Cochlicopa lubrica</i>	3	2	5	6	0	1	0	17	41	0	0	2	56	136	
<i>Cochlicopa lubricella</i>	0	0	0	0	0	2	0	0	0	0	0	0	0	0	
<i>Cochlicopa nitens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>*Pyramidula pusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Columella edentula</i>	15	5	17	37	0	2	0	28	93	0	0	7	0	3	
<i>Vertigo pusilla</i>	0	0	0	0	1	27	4	12	0	0	387	41	25	0	
<i>Vertigo antivertigo</i>	0	0	0	0	0	0	0	0	0	2	23	0	0	0	
<i>Vertigo substriata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Vertigo alpestris</i>	0	0	0	0	0	10	0	0	0	0	0	0	0	0	
<i>*Sphyradium doliolum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Pagodulina pagodula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Argna bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Vallonia costata</i>	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
<i>Vallonia pulchella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Acanthinula aculeata</i>	9	3	1	14	2	0	2	18	34	14	2	0	0	0	
<i>*Mastus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ena montana</i>	12	6	11	0	0	0	2	4	0	0	0	0	0	0	
<i>Ena obscura</i>	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
<i>Punctum pygmaeum</i>	15	13	0	2	182	101	145	4	5	192	424	142	480	38	
<i>Discus ruderatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Discus rotundatus</i>	10	15	60	103	30	12	14	33	75	40	24	99	19	76	
<i>Discus perspectivus</i>	50	49	88	27	0	0	0	0	0	0	0	0	0	0	
<i>Vitrina pellucida</i>	2	5	6	3	6	13	16	25	31	0	5	9	23	5	
<i>Semilimax semilimax</i>	0	0	0	0	0	2	4	2	2	0	0	12	46	29	
<i>Semilimax kotulae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Eucobresia diaphana</i>	0	0	0	0	0	0	0	2	7	24	7	0	0	0	
<i>Eucobresia nivalis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Vitrea diaphana</i>	23	4	2	0	0	0	2	0	2	0	0	16	0	0	
<i>Vitrea transsylvanica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Vitrea crystallina</i>	0	0	0	0	0	2	0	0	8	0	0	5	0	3	
<i>Vitrea contracta</i>	0	0	0	0	2	2	0	0	0	0	0	0	0	0	
<i>Aegopinella pura</i>	54	31	28	66	30	6	21	20	49	23	2	54	107	36	

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	Sudetes (a)														
	Mus	Mus	Mus	Mus	Mys	Mys	Mys	Mys	Mys	Bar	Bar	Bar	Bar	Bar	
	1	2	3	4	1	2	3	4	5	1	2	3	4	5	
<i>Aegopinella minor</i>	9	3	6	69	11	39	9	8	15	5	5	6	14	0	
<i>Aegopinella epipedostoma</i>	10	3	2	0	0	0	0	0	0	0	0	0	0	0	
<i>Aegopinella nitidula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Nesovitrea hammonis</i>	1	0	0	0	1	2	0	9	10	8	2	0	0	2	
<i>Nesovitrea petronella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Oxychilus alliarius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Oxychilus cellarius</i>	4	3	0	1	6	2	7	5	0	17	5	20	15	0	
<i>Oxychilus deubeli</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Oxychilus draparnaudi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Oxychilus glaber</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Oxychilus depressus</i>	0	0	0	0	0	0	0	0	0	2	0	0	0	0	
<i>Daudebardia rufa</i>	2	1	0	0	0	1	0	0	0	0	0	0	0	0	
<i>Daudebardia brevipes</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Carpathica calophana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Zonitoides nitidus</i>	0	0	0	0	0	0	0	0	0	0	0	0	7	5	
<i>Euconulus fulvus</i>	3	4	3	2	0	1	2	6	10	6	32	4	9	7	
<i>Euconulus alderi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Cochlodina laminata</i>	6	4	15	20	18	11	6	8	12	3	2	12	4	10	
<i>Cochlodina costata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Cochlodina orthostoma</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ruthenica filograna</i>	0	0	0	0	0	0	0	0	0	0	0	6	0	0	
<i>Macrogastra ventricosa</i>	0	0	0	0	0	0	0	0	0	2	0	0	0	0	
<i>Macrogastra latestriata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Macrogastra plicatula</i>	17	10	37	18	0	0	0	12	3	0	0	0	0	0	
<i>Macrogastra tumida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Clausilia parvula</i>	0	0	0	0	0	2	3	0	0	0	0	0	0	0	
<i>Clausilia dubia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Clausilia pumila</i>	2	7	40	70	0	0	0	16	3	0	0	18	4	24	
<i>Clausilia cruciata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Clausilia bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Laciniaria plicata</i>	0	0	0	0	2	4	9	0	0	0	0	0	0	0	
<i>Alinda biplicata</i>	67	26	123	40	1	9	10	27	0	3	1	25	8	30	
<i>Balea fallax</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Balea stabilis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>*Vestia sp.</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

(continues)

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	Sudetes (a)														
	Mus	Mus	Mus	Mus	Mys	Mys	Mys	Mys	Mys	Bar	Bar	Bar	Bar	Bar	
	1	2	3	4	1	2	3	4	5	1	2	3	4	5	
<i>Vestia gulo</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Vestia turgida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Vestia elata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Bulgarica cana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Bradybaena fruticum</i>	4	0	4	2	0	0	4	2	2	0	0	0	0	3	
<i>Perforatella bidentata</i>	20	3	3	15	0	0	0	0	0	0	0	0	0	3	
<i>Perforatella dibothrion</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Perforatella incarnata</i>	8	7	20	13	9	6	25	24	7	14	13	47	26	3	
<i>Perforatella vicina</i>	12	5	7	1	0	0	0	0	0	0	2	0	7	6	
<i>Perforatella umbrosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Perforatella rubiginosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Trochulus villosulus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Trochulus hispidus</i>	5	2	8	0	0	0	0	0	0	0	0	0	7	7	
* <i>Trochulus lubomirskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Trochulus bakowskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Trochulus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Trochulus unidentatus</i>	0	0	0	0	0	0	0	0	0	0	0	10	0	0	
<i>Euomphalia strigella</i>	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Helicodonta obvoluta</i>	8	4	7	0	0	0	0	0	0	0	1	0	0	0	
<i>Helicigona lapicida</i>	0	0	0	0	0	2	5	0	0	0	1	2	3	0	
<i>Arianta arbustorum</i>	6	0	5	2	2	3	0	0	0	5	4	2	3	2	
<i>Causa holosericum</i>	0	1	0	0	0	0	0	0	0	4	7	2	0	0	
<i>Chilostoma faustinum</i>	0	0	0	0	0	0	0	0	0	0	0	0	4	0	
<i>Drobacia banaticum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Isognomostoma isognomostoma</i>	0	0	0	0	18	18	11	21	7	10	4	18	4	7	
<i>Cepaea hortensis</i>	3	3	4	1	0	3	4	0	0	0	0	0	4	0	
<i>Cepaea nemoralis</i>	0	0	0	0	0	0	0	0	0	0	0	1	0	2	
<i>Helix pomatia</i>	4	1	1	0	0	0	3	0	0	0	0	0	0	0	

	Sudetes (b)																			
	Ksi	Ksi	Ksi	Ksi	Mly	Mly	Mly	Mly	Mly	Mil	Mil	Mil	Mil	Mil	Mil	Sto	Sto	Sto	Sto	
	1	2	3	4	1	2	3	4	5	1	2	3	4	5	6	1	2	3	4	
<i>Acicula parcelineata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Acicula polita</i>	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Acicula perpusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Carychium minimum</i>	0	0	0	0	0	0	0	0	0	11	0	0	0	0	8	0	0	44	8	
<i>Carychium tridentatum</i>	55	47	52	101	110	23	10	130	72	300	11	0	2	0	32	85	28	8	44	
<i>Succinea oblonga</i>	2	9	3	4	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Succinea putris</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	
<i>Cochlicopa lubrica</i>	5	7	5	9	19	2	7	3	5	2	4	0	0	0	2	0	19	6	25	
<i>Cochlicopa lubricella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	
<i>Cochlicopa nitens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Pyramidula pusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Columella edentula</i>	17	21	22	17	8	21	18	20	9	0	3	0	0	2	9	0	27	22	12	
<i>Vertigo pusilla</i>	5	17	13	151	64	6	17	2	1	5	5	0	1	0	0	3	20	0	0	
<i>Vertigo antivertigo</i>	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	
<i>Vertigo substriata</i>	0	0	0	0	16	10	0	0	4	0	0	0	0	0	0	0	3	0	2	
<i>Vertigo alpestris</i>	0	0	0	34	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	
* <i>Sphyradium doliolum</i>	0	0	0	0	0	0	0	0	0	4	22	16	11	10	0	0	0	0	0	
<i>Pagodulina pagodula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Argna bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Vallonia costata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	8	0	0	
<i>Vallonia pulchella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Acanthinula aculeata</i>	8	9	5	9	18	5	9	20	8	5	6	0	0	0	0	0	43	60	4	
* <i>Mastus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ena montana</i>	2	5	4	3	0	0	0	0	0	5	7	12	21	31	34	2	14	0	3	
<i>Ena obscura</i>	2	3	2	3	0	0	0	0	0	1	5	9	3	17	18	0	0	0	0	
<i>Punctum pygmaeum</i>	45	28	26	48	33	28	90	131	35	152	5	7	0	2	4	20	55	10	4	
<i>Discus ruderatus</i>	0	0	0	0	0	0	0	8	2	0	0	0	0	0	0	18	11	0	0	
<i>Discus rotundatus</i>	65	33	31	45	51	6	6	25	16	40	3	23	32	42	34	21	44	29	4	
<i>Discus perspectivus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Vitrina pellucida</i>	8	15	16	3	9	0	21	1	2	7	5	0	0	4	0	10	57	5	15	
<i>Semilimax semilimax</i>	4	8	4	2	0	2	3	5	3	0	6	5	4	1	1	0	0	0	0	
<i>Semilimax kotulae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Eucobresia diaphana</i>	3	14	5	6	0	0	0	0	1	6	0	0	0	0	0	0	3	4	3	
<i>Eucobresia nivalis</i>	0	0	0	0	9	2	0	2	3	0	0	0	0	0	0	0	0	0	0	
<i>Vitrea diaphana</i>	4	3	4	4	12	13	0	25	23	0	0	0	0	1	0	4	8	0	0	
<i>Vitrea transsylvanica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Vitrea crystallina</i>	0	0	0	0	0	10	1	0	0	0	0	0	0	0	0	7	2	25	5	
<i>Vitrea contracta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Aegopinella pura</i>	9	2	6	8	47	36	14	31	38	12	5	0	2	3	0	26	13	16	8	

(continues)

(continued)

	Sudetes (b)																			
	Ksi				Mly					Mil						Sto				
	1	2	3	4	1	2	3	4	5	1	2	3	4	5	6	1	2	3	4	
<i>Aegopinella minor</i>	10	2	3	6	21	0	0	4	4	0	19	10	0	0	2	6	3	5	2	
<i>Aegopinella epipedostoma</i>	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	
<i>Aegopinella nitidula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Nesovitrea hammonis</i>	2	3	2	6	19	10	3	30	22	2	1	4	0	1	0	2	15	79	8	
<i>Nesovitrea petronella</i>	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	
<i>Oxychilus alliarius</i>	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Oxychilus cellarius</i>	6	3	2	3	0	0	0	0	0	18	4	12	0	0	14	0	0	0	0	
<i>Oxychilus deubeli</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Oxychilus draparnaudi</i>	0	2	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
<i>Oxychilus glaber</i>	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	2	0	0	0	
<i>Oxychilus depressus</i>	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	2	0	0	0	
<i>Daudebardia rufa</i>	1	0	1	1	0	0	0	0	0	0	1	1	0	0	0	3	0	0	0	
<i>Daudebardia brevipes</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Carpathica calophana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Zonitoides nitidus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	
<i>Euconulus fulvus</i>	11	9	7	41	45	31	3	26	24	6	0	0	0	0	0	2	14	15	2	
<i>Euconulus alderi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Cochlodina laminata</i>	79	53	63	82	0	0	0	8	0	13	17	16	11	25	131	12	36	0	16	
<i>Cochlodina costata</i>	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	
<i>Cochlodina orthostoma</i>	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Ruthenica filograna</i>	6	0	0	3	3	7	19	0	0	0	0	0	0	0	0	4	8	0	7	
<i>Macrogastra ventricosa</i>	0	0	0	0	4	11	4	2	0	0	0	0	0	0	0	0	13	7	11	
<i>Macrogastra latestriata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
<i>Macrogastra plicatula</i>	58	32	35	144	0	22	3	7	29	35	0	3	6	0	19	43	89	0	25	
<i>Macrogastra tumida</i>	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	
<i>Clausilia parvula</i>	0	0	0	0	0	0	0	0	0	0	40	0	0	1	0	0	0	0	0	
<i>Clausilia dubia</i>	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Clausilia pumila</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	23	0	0	
<i>Clausilia cruciata</i>	0	0	0	0	20	3	4	5	13	0	0	0	0	0	0	5	13	0	0	
<i>Clausilia bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Laciniaria plicata</i>	3	4	6	2	0	0	0	0	0	31	0	14	17	36	10	22	0	0	0	
<i>Alinda biplicata</i>	27	17	16	47	7	5	10	2	9	14	41	12	7	46	29	0	36	0	29	
<i>Balea fallax</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Balea stabilis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Vestia</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

(continues)

(continued)

	Sudetes (b)																			
	Ksi				Mly					Mil						Sto				
	1	2	3	4	1	2	3	4	5	1	2	3	4	5	6	1	2	3	4	
<i>Vestia gulo</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Vestia turgida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Vestia elata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Bulgarica cana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Bradybaena fruticum</i>	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Perforatella bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Perforatella dibothrion</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Perforatella incarnata</i>	38	12	9	34	15	9	6	2	12	5	33	60	36	46	53	14	20	13	7	
<i>Perforatella vicina</i>	8	4	6	5	0	0	0	0	0	10	10	17	0	0	4	0	0	0	47	
<i>Perforatella umbrosa</i>	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	
<i>Perforatella rubiginosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Trochulus villosulus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Trochulus hispidus</i>	0	3	2	0	0	0	2	12	2	2	0	0	0	13	19	0	0	3	0	
* <i>Trochulus lubomirskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	
* <i>Trochulus bakowskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Trochulus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
* <i>Trochulus unidentatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Euomphalia strigella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Helicodonta obvoluta</i>	50	5	6	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Helicigona lapicida</i>	5	0	4	14	0	0	0	0	0	0	4	3	1	39	0	3	0	0	0	
<i>Arianta arbustorum</i>	19	4	2	9	6	3	2	4	16	9	11	0	8	2	44	5	8	18	34	
<i>Causa holosericum</i>	3	8	12	35	1	0	0	1	0	0	0	0	0	0	0	12	0	0	1	
<i>Chilostoma faustinum</i>	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Drobacia banaticum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Isognomostoma isognomostoma</i>	12	8	5	5	0	0	0	0	0	4	3	6	3	0	0	12	0	0	3	
<i>Cepaea hortensis</i>	0	0	0	2	0	0	0	0	0	0	8	3	1	23	2	0	0	0	3	
<i>Cepaea nemoralis</i>	5	2	3	7	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	
<i>Helix pomatia</i>	3	4	2	4	0	0	0	0	0	0	2	5	1	23	10	4	3	3	2	

	Białowieża																
	Bia 2	Bia 5	Bia 9	Bia 11	Bia 12	Bia 13	Bia 16	Bia 1	Bia 4	Bia 10	Bia 14	Bia 15	Bia 3	Bia 17	Bia 6	Bia 7	Bia 8
<i>Acicula parcelineata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Acicula polita</i>	0	0	0	0	0	15	2	0	0	0	0	0	0	1	0	2	0
* <i>Acicula perpusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carychium minimum</i>	269	4	14	22	61	65	18	0	0	5	1	0	13	4	0	5	0
<i>Carychium tridentatum</i>	4	8	0	4	11	5	2	1	0	21	1	20	24	9	12	130	15
<i>Succinea oblonga</i>	5	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
<i>Succinea putris</i>	4	6	6	17	37	29	29	0	0	0	4	0	0	0	0	0	0
<i>Cochlicopa lubrica</i>	45	30	15	15	47	31	15	0	4	6	4	0	4	8	8	19	6
<i>Cochlicopa lubricella</i>	0	0	0	3	0	0	2	0	0	0	0	0	0	2	0	8	0
<i>Cochlicopa nitens</i>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Pyramidula pusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Columella edentula</i>	16	2	5	1	11	6	11	0	1	0	2	4	0	2	3	3	1
<i>Vertigo pusilla</i>	5	0	3	6	1	3	14	0	2	1	0	2	2	1	3	7	9
<i>Vertigo antivertigo</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vertigo substriata</i>	59	0	7	0	6	3	3	1	2	0	1	2	0	3	0	6	0
<i>Vertigo alpestris</i>	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
* <i>Sphyradium doliolum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Pagodulina pagodula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Argna bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vallonia costata</i>	0	0	0	5	0	14	11	0	0	0	0	3	4	1	0	0	0
<i>Vallonia pulchella</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Acanthinula aculeata</i>	12	1	8	0	3	19	3	0	1	0	0	0	3	3	3	18	2
* <i>Mastus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ena montana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ena obscura</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Punctum pygmaeum</i>	108	13	13	6	25	24	23	3	18	5	3	28	21	16	21	105	23
<i>Discus ruderatus</i>	4	7	4	2	0	3	4	7	22	7	39	29	27	38	38	7	6
<i>Discus rotundatus</i>	1	6	12	0	0	0	0	17	22	21	26	43	36	16	22	27	24
<i>Discus perspectivus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea pellucida</i>	2	2	1	2	2	0	4	1	1	0	0	0	2	2	1	8	3
<i>Semilimax semilimax</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Semilimax kotulae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia diaphana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia nivalis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea diaphana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea transsylvanica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea crystallina</i>	55	11	18	12	9	22	10	2	0	0	5	7	27	4	10	15	3
<i>Vitrea contracta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Aegopinella pura</i>	18	9	37	5	6	31	4	0	3	2	0	2	12	8	5	14	5

(continues)

(continued)

	Białowieża																
	Bia 2	Bia 5	Bia 9	Bia 11	Bia 12	Bia 13	Bia 16	Bia 1	Bia 4	Bia 10	Bia 14	Bia 15	Bia 3	Bia 17	Bia 6	Bia 7	Bia 8
<i>Aegopinella minor</i>	0	2	0	0	0	1	0	0	1	0	0	1	1	0	0	8	2
<i>Aegopinella epipedostoma</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Aegopinella nitidula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Nesovitrea hammonis</i>	40	6	31	3	4	7	5	36	42	11	9	26	40	18	5	9	6
<i>Nesovitrea petronella</i>	27	24	14	6	9	15	4	31	25	5	11	10	11	16	18	11	5
<i>Oxychilus alliarius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus cellarius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus deubeli</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus draparnaudi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus glaber</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus depressus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Daudebardia rufa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Daudebardia brevipes</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carpathica calophana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Zonitoides nitidus</i>	1	1	6	6	46	11	4	0	0	2	13	0	3	8	1	0	0
<i>Euconulus fulvus</i>	18	4	4	5	3	5	1	22	21	2	7	10	11	8	6	20	5
<i>Euconulus alderi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina laminata</i>	6	6	6	13	8	4	26	11	6	8	4	20	25	20	14	18	7
<i>Cochlodina costata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina orthostoma</i>	0	0	0	0	0	2	0	0	1	0	2	0	5	5	2	3	1
<i>Ruthenica filograna</i>	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0
<i>Macrogastra ventricosa</i>	0	0	1	2	3	0	3	0	0	0	0	0	1	1	1	2	2
<i>Macrogastra latestriata</i>	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0	7	0
<i>Macrogastra plicatula</i>	3	7	6	19	1	9	1	5	0	20	14	10	33	31	15	8	3
<i>Macrogastra tumida</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0
<i>Clausilia parvula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia dubia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1
<i>Clausilia pumila</i>	0	0	0	0	3	0	4	0	0	0	0	0	0	1	0	1	0
<i>Clausilia cruciata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia bidentata</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Laciniaria plicata</i>	0	0	1	0	0	1	2	0	3	5	14	2	7	9	10	13	5
<i>Alinda biplicata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea fallax</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea stabilis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Vestia</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(continues)

(continued)

	Białowieża																
	Bia 2	Bia 5	Bia 9	Bia 11	Bia 12	Bia 13	Bia 16	Bia 1	Bia 4	Bia 10	Bia 14	Bia 15	Bia 3	Bia 17	Bia 6	Bia 7	Bia 8
<i>Vestia gulo</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vestia turgida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vestia elata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bulgarica cana</i>	0	0	0	0	0	0	4	0	2	1	1	0	2	4	7	5	5
<i>Bradybaena fruticum</i>	6	6	8	11	9	14	25	1	0	0	2	2	3	2	3	4	1
<i>Perforatella bidentata</i>	14	17	14	11	16	15	19	0	0	2	0	0	8	4	9	6	6
<i>Perforatella dibothrion</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella incarnata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella vicina</i>	3	0	4	21	6	24	6	0	1	2	3	5	5	7	9	9	19
<i>Perforatella umbrosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella rubiginosa</i>	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus villosulus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus hispidus</i>	0	5	0	20	0	0	0	0	0	0	0	0	2	0	0	1	0
* <i>Trochulus lubomirskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bakowskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus unidentatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Euomphalia strigella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helicodonta obvoluta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helicigona lapicida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Arianta arbustorum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Causa holosericum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chilostoma faustinum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Drobacia banaticum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Isognomostoma isognomostoma</i>	0	0	3	0	0	0	0	0	0	0	0	0	0	1	0	0	0
<i>Cepaea hortensis</i>	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
<i>Cepaea nemoralis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helix pomatia</i>	0	2	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0

	Ukraine											
	Kuz 1	Kuz 2	Kuz 3	Kuz 4	Kuz 5	Ugo 1	Ugo 2	Ugo 3	Ugo 4	Ugo 5	Ugo 6	Ugo 7
<i>Acicula parcelineata</i>	0	30	10	19	7	2	2	0	4	0	2	2
<i>Acicula polita</i>	2	5	4	12	8	2	2	0	0	1	3	3
* <i>Acicula perpusilla</i>	0	4	2	5	1	0	0	0	0	0	0	0
<i>Carychium minimum</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carychium tridentatum</i>	145	532	107	74	87	152	148	4	31	7	19	20
<i>Succinea oblonga</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Succinea putris</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlicopa lubrica</i>	0	1	2	0	0	0	0	0	0	0	0	1
<i>Cochlicopa lubricella</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlicopa nitens</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Pyramidula pusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Columella edentula</i>	3	0	0	0	0	3	2	0	0	0	0	0
<i>Vertigo pusilla</i>	7	2	0	0	0	0	4	0	0	0	0	0
<i>Vertigo antivertigo</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vertigo substriata</i>	0	2	0	0	0	2	0	0	0	0	0	0
<i>Vertigo alpestris</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Sphyradium doliolum</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Pagodulina pagodula</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Argna bielzi</i>	0	2	0	2	0	7	2	7	0	0	3	2
<i>Vallonia costata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vallonia pulchella</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Acanthinula aculeata</i>	8	8	32	14	7	0	11	0	3	2	2	4
* <i>Mastus bielzi</i>	5	3	9	1	5	1	0	0	0	10	0	0
<i>Ena montana</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ena obscura</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Punctum pygmaeum</i>	4	30	19	37	11	14	15	6	3	12	8	10
<i>Discus ruderatus</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Discus rotundatus</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Discus perspectivus</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrina pellucida</i>	3	0	0	0	0	0	0	0	0	0	0	0
<i>Semilimax semilimax</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Semilimax kotulae</i>	0	0	0	0	0	2	1	1	2	0	2	2
<i>Eucobresia diaphana</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia nivalis</i>	0	0	0	1	0	0	0	0	0	0	0	0
<i>Vitrea diaphana</i>	7	12	17	27	13	17	12	8	8	8	5	27
<i>Vitrea transsylvanica</i>	2	0	1	0	6	2	5	0	4	5	8	0
<i>Vitrea crystallina</i>	0	0	0	0	0	0	0	0	0	0	0	3
<i>Vitrea contracta</i>	0	2	0	4	0	1	0	0	0	0	2	0
<i>Aegopinella pura</i>	5	10	4	3	7	25	0	0	8	7	11	2

(continues)

(continued)

	Ukraine											
	Kuz 1	Kuz 2	Kuz 3	Kuz 4	Kuz 5	Ugo 1	Ugo 2	Ugo 3	Ugo 4	Ugo 5	Ugo 6	Ugo 7
<i>Aegopinella minor</i>	12	11	34	23	14	14	6	0	8	5	11	5
<i>Aegopinella epipedostoma</i>	8	8	2	4	15	8	5	0	15	4	8	0
<i>Aegopinella nitidula</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Nesovitrea hammonis</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Nesovitrea petronella</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus alliarius</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus cellarius</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus deubeli</i>	18	7	5	3	14	19	0	9	4	4	6	4
<i>Oxychilus draparnaudi</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus glaber</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus depressus</i>	2	3	1	1	5	0	16	0	4	1	5	0
<i>Daudebardia rufa</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Daudebardia brevipes</i>	2	6	6	5	5	0	1	1	2	0	3	1
<i>Carpathica calophana</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Zonitoides nitidus</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Euconulus fulvus</i>	0	3	0	0	1	2	1	1	0	4	2	0
<i>Euconulus alderi</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina laminata</i>	0	0	1	0	0	0	3	0	3	0	9	3
<i>Cochlodina costata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina orthostoma</i>	0	3	1	4	2	8	3	5	0	18	9	2
<i>Ruthenica filograna</i>	0	10	8	21	2	0	0	0	0	21	0	1
<i>Macrogastra ventricosa</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Macrogastra latestriata</i>	1	1	0	0	0	6	39	4	30	3	9	0
<i>Macrogastra plicatula</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Macrogastra tumida</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia parvula</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia dubia</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia pumila</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia cruciata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Laciniaria plicata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Alinda biplicata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea fallax</i>	14	0	3	4	2	7	0	3	10	7	17	0
<i>Balea stabilis</i>	0	0	0	0	0	0	6	6	0	0	0	8
* <i>Vestia</i> sp.	25	3	14	8	15	16	0	5	0	12	8	6

(continues)

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	Ukraine											
	Kuz 1	Kuz 2	Kuz 3	Kuz 4	Kuz 5	Ugo 1	Ugo 2	Ugo 3	Ugo 4	Ugo 5	Ugo 6	Ugo 7
<i>Vestia gulo</i>	26	6	12	2	3	8	15	0	3	6	22	14
<i>Vestia turgida</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vestia elata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bulgarica cana</i>	0	0	0	2	0	0	0	0	0	0	0	0
<i>Bradybaena fruticum</i>	3	0	0	1	2	0	0	0	0	0	0	0
<i>Perforatella bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella dibothrion</i>	0	0	3	0	0	6	3	0	6	13	5	2
<i>Perforatella incarnata</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella vicina</i>	13	17	10	3	7	19	31	4	5	11	24	5
<i>Perforatella umbrosa</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella rubiginosa</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus villosulus</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus hispidus</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus lubomirskii</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bakowskii</i>	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bielzi</i>	6	0	1	3	0	0	0	0	0	0	0	0
* <i>Trochulus unidentatus</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Euomphalia strigella</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helicodonta obvoluta</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helicigona lapicida</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Arianta arbustorum</i>	0	0	0	0	0	0	2	0	0	0	0	1
<i>Causa holosericum</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chilostoma faustinum</i>	4	32	23	9	9	25	21	4	2	19	6	9
<i>Drobacia banaticum</i>	8	8	4	2	9	0	0	0	0	0	0	0
<i>Isognomostoma isognomostoma</i>	22	9	13	6	11	29	37	9	30	17	22	13
<i>Cepaea hortensis</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cepaea nemoralis</i>	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helix pomatia</i>	1	4	2	1	0	0	0	0	0	1	0	0

	S.E. Poland (a)															
	Bie	Bie	Bie	Bie	Bie	Bie	Bie	Bie	Bie	San	San	San	San	San	San	San
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7
<i>Acicula parcelineata</i>	0	0	0	1	1	6	0	0	0	0	0	0	1	1	1	1
<i>Acicula polita</i>	0	0	0	0	0	0	0	0	1	0	0	3	0	4	1	1
* <i>Acicula perpusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carychium minimum</i>	0	0	34	5	0	0	0	0	0	0	6	0	0	0	2	0
<i>Carychium tridentatum</i>	13	16	120	15	32	269	5	56	88	33	17	8	3	41	12	61
<i>Succinea oblonga</i>	0	0	11	5	0	0	0	42	0	0	5	0	0	15	0	16
<i>Succinea putris</i>	0	0	64	5	0	0	0	14	0	0	5	3	11	0	0	0
<i>Cochlicopa lubrica</i>	0	0	15	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlicopa lubricella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlicopa nitens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Pyramidula pusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Columella edentula</i>	11	7	64	13	4	17	5	135	1	5	0	0	13	2	0	4
<i>Vertigo pusilla</i>	0	6	10	10	5	10	13	2	2	2	0	0	33	1	2	6
<i>Vertigo antivertigo</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vertigo substriata</i>	0	15	1	0	0	3	0	26	0	0	0	0	0	0	1	0
<i>Vertigo alpestris</i>	0	0	0	3	0	1	0	0	2	0	0	0	0	0	0	0
* <i>Sphyradium doliolum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0
<i>Pagodulina pagodula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Argna bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vallonia costata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vallonia pulchella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Acanthinula aculeata</i>	3	2	0	14	44	19	5	20	10	16	8	4	17	6	22	5
* <i>Mastus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ena montana</i>	0	1	23	2	12	2	34	8	0	0	10	0	9	11	11	4
<i>Ena obscura</i>	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0
<i>Punctum pygmaeum</i>	136	46	85	16	165	262	19	48	85	46	27	23	51	6	42	45
<i>Discus ruderatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Discus rotundatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Discus perspectivus</i>	0	0	21	39	13	70	39	53	23	14	80	3	18	35	32	13
<i>Vitrina pellucida</i>	0	0	25	28	7	4	10	121	1	0	0	0	0	0	0	0
<i>Semilimax semilimax</i>	3	4	6	8	10	7	1	0	7	2	0	0	2	2	3	0
<i>Semilimax kotulae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia diaphana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia nivalis</i>	2	7	0	8	4	5	3	5	0	0	0	3	0	0	0	0
<i>Vitrea diaphana</i>	1	0	2	5	5	24	16	2	5	77	33	17	11	32	52	49
<i>Vitrea transsylvanica</i>	5	4	9	7	5	7	2	3	8	0	0	0	0	0	0	0
<i>Vitrea crystallina</i>	0	0	3	0	0	29	0	7	2	0	0	0	0	1	0	0
<i>Vitrea contracta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Aegopinella pura</i>	25	27	20	17	42	60	21	52	33	35	11	19	5	3	10	17

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	S.E. Poland (a)															
	Bie 1	Bie 2	Bie 3	Bie 4	Bie 5	Bie 6	Bie 7	Bie 8	Bie 9	San 1	San 2	San 3	San 4	San 5	San 6	San 7
<i>Aegopinella minor</i>	0	0	0	0	0	0	0	0	0	19	2	23	20	12	32	68
<i>Aegopinella epipedostoma</i>	4	8	4	16	41	22	32	56	15	4	3	3	3	4	12	34
<i>Aegopinella nitidula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Nesovitrea hammonis</i>	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
<i>Nesovitrea petronella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus alliarius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus cellarius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus deubeli</i>	5	0	1	18	2	9	5	2	0	10	2	7	0	6	2	2
<i>Oxychilus draparnaudi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus glaber</i>	0	0	0	1	0	0	1	0	3	4	2	0	17	2	0	1
<i>Oxychilus depressus</i>	0	2	0	2	0	4	0	0	0	0	0	6	0	0	1	1
<i>Daudebardia rufa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Daudebardia brevipes</i>	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0
<i>Carpathica calophana</i>	2	0	0	0	0	0	2	0	1	3	0	0	0	0	0	0
<i>Zonitoides nitidus</i>	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
<i>Euconulus fulvus</i>	9	16	45	2	30	6	3	3	3	0	0	0	0	0	0	0
<i>Euconulus alderi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina laminata</i>	0	0	0	0	0	0	0	0	0	5	15	3	1	0	0	3
<i>Cochlodina costata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina orthostoma</i>	0	1	1	1	2	3	0	3	11	0	2	0	0	0	0	0
<i>Ruthenica filograna</i>	0	0	0	2	3	0	52	0	15	0	32	61	0	0	0	0
<i>Macrogastra ventricosa</i>	0	0	0	0	0	0	1	19	0	0	0	0	0	0	0	0
<i>Macrogastra latestriata</i>	10	49	10	10	7	38	2	0	8	0	0	0	19	0	0	0
<i>Macrogastra plicatula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Macrogastra tumida</i>	8	4	72	37	14	22	44	51	7	73	36	85	46	23	59	92
<i>Clausilia parvula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia dubia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia pumila</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia cruciata</i>	0	0	0	4	5	0	0	2	4	0	0	0	0	0	0	0
<i>Clausilia bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Laciniaria plicata</i>	0	0	0	0	0	0	0	0	0	2	4	0	5	7	5	0
<i>Alinda biplicata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea fallax</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea stabilis</i>	0	0	0	6	13	2	23	0	4	0	11	37	0	6	32	2
* <i>Vestia</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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	S.E. Poland (a)															
	Bie 1	Bie 2	Bie 3	Bie 4	Bie 5	Bie 6	Bie 7	Bie 8	Bie 9	San 1	San 2	San 3	San 4	San 5	San 6	San 7
<i>Vestia gulo</i>	13	2	38	16	3	9	2	8	2	57	15	73	3	9	7	25
<i>Vestia turgida</i>	0	0	39	8	3	0	13	5	1	14	12	0	21	0	8	0
<i>Vestia elata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bulgarica cana</i>	0	2	1	2	0	5	2	4	5	0	25	12	15	28	0	4
<i>Bradybaena fruticum</i>	0	0	90	0	0	0	6	9	0	0	5	31	0	20	0	2
<i>Perforatella bidentata</i>	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella dibothrion</i>	12	0	0	12	15	3	22	8	12	10	39	4	3	1	2	8
<i>Perforatella incarnata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella vicina</i>	20	5	18	20	29	7	2	22	28	0	5	0	15	7	6	2
<i>Perforatella umbrosa</i>	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0
<i>Perforatella rubiginosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus villosulus</i>	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus hispidus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus lubomirskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bakowskii</i>	0	0	41	0	0	15	0	60	0	0	0	0	0	0	0	0
* <i>Trochulus bielzi</i>	0	0	0	10	3	0	18	0	0	14	12	15	1	0	17	9
* <i>Trochulus unidentatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Euomphalia strigella</i>	0	0	0	0	0	0	0	0	0	6	9	0	0	7	0	0
<i>Helicodonta obvoluta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helicigona lapicida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Arianta arbustorum</i>	1	0	18	3	7	4	3	0	0	2	8	22	0	2	0	2
<i>Causa holosericum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chilostoma faustinum</i>	9	0	7	8	9	13	5	0	17	9	3	4	15	25	6	12
<i>Drobacia banaticum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Isognomostoma isognomostoma</i>	10	5	19	8	26	27	0	32	6	13	8	35	8	35	15	9
<i>Cepaea hortensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cepaea nemoralis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helix pomatia</i>	0	0	0	4	0	0	0	0	0	17	19	4	1	3	7	3

	S.E. Poland (b)															
	Prz	Prz	Prz	Prz	Prz	Prz	Ust	Kom	Kom	Kom	Rym	Rym	Rym	Gor	Gor	Gor
	1	2	3	4	5	6	1	1	2	3	1	2	3	1	2	3
<i>Acicula parcelineata</i>	0	0	0	0	0	1	0	0	2	1	0	0	0	0	0	0
<i>Acicula polita</i>	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
* <i>Acicula perpusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carychium minimum</i>	0	3	0	0	0	0	25	0	0	87	6	0	0	0	0	0
<i>Carychium tridentatum</i>	23	19	301	28	104	46	59	47	118	215	56	54	7	0	0	0
<i>Succinea oblonga</i>	0	0	1	0	5	4	0	0	0	0	2	12	3	0	0	0
<i>Succinea putris</i>	0	0	2	0	6	0	81	0	2	35	3	2	0	4	0	23
<i>Cochlicopa lubrica</i>	0	2	2	0	0	5	0	0	5	1	118	5	0	0	0	0
<i>Cochlicopa lubricella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlicopa nitens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Pyramidula pusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Columella edentula</i>	49	6	6	0	18	2	11	5	7	17	17	3	54	3	0	7
<i>Vertigo pusilla</i>	0	37	1	0	3	3	24	4	17	13	7	5	47	23	21	0
<i>Vertigo antivertigo</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
<i>Vertigo substriata</i>	0	0	0	0	0	0	0	0	0	18	0	0	5	0	0	0
<i>Vertigo alpestris</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Sphyradium doliolum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Pagodulina pagodula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0
<i>Argna bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vallonia costata</i>	0	0	0	0	1	0	0	0	1	0	2	0	0	0	0	0
<i>Vallonia pulchella</i>	0	0	0	0	0	0	0	0	0	0	7	1	0	0	0	0
<i>Acanthinula aculeata</i>	1	2	11	0	19	32	2	15	13	23	3	21	9	2	6	0
* <i>Mastus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ena montana</i>	0	0	0	0	0	0	28	10	5	0	30	13	0	0	0	0
<i>Ena obscura</i>	0	3	0	1	3	2	0	4	0	2	0	0	0	0	0	0
<i>Punctum pygmaeum</i>	8	2	2	3	47	44	5	59	93	44	22	141	21	21	12	3
<i>Discus ruderatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Discus rotundatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Discus perspectivus</i>	5	6	92	9	0	22	11	58	4	3	46	18	7	0	4	0
<i>Vitrina pellucida</i>	14	7	3	0	0	1	1	2	2	21	1	12	60	11	12	3
<i>Semilimax semilimax</i>	1	0	0	0	0	4	1	3	8	5	0	0	0	0	0	0
<i>Semilimax kotulae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia diaphana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia nivalis</i>	2	0	0	0	0	0	0	0	0	0	1	4	2	0	0	1
<i>Vitrea diaphana</i>	2	0	9	7	14	23	0	14	0	2	76	9	13	18	11	3
<i>Vitrea transsylvanica</i>	0	0	0	1	0	0	0	0	0	2	5	2	3	0	0	0
<i>Vitrea crystallina</i>	0	0	0	2	9	9	0	2	1	0	10	0	0	0	0	0
<i>Vitrea contracta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Aegopinella pura</i>	7	5	3	11	3	29	5	13	22	13	13	61	16	17	13	0

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	S.E. Poland (b)															
	Prz	Prz	Prz	Prz	Prz	Prz	Ust	Kom	Kom	Kom	Rym	Rym	Rym	Gor	Gor	Gor
	1	2	3	4	5	6	1	1	2	3	1	2	3	1	2	3
<i>Aegopinella minor</i>	10	9	4	4	3	27	11	8	24	0	17	16	11	7	6	8
<i>Aegopinella epipedostoma</i>	6	0	10	0	27	8	2	4	3	0	17	4	3	0	3	0
<i>Aegopinella nitidula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Nesovitrea hammonis</i>	0	0	0	0	0	0	0	0	0	23	0	0	3	6	0	2
<i>Nesovitrea petronella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus alliarius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus cellarius</i>	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus deubeli</i>	4	0	6	0	0	25	2	11	3	0	5	0	4	18	12	6
<i>Oxychilus draparnaudi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus glaber</i>	0	0	4	0	6	6	0	0	1	2	9	4	2	8	5	2
<i>Oxychilus depressus</i>	0	0	0	0	0	2	0	0	0	0	3	0	0	0	0	0
<i>Daudebardia rufa</i>	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
<i>Daudebardia brevipes</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carpathica calophana</i>	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
<i>Zonitoides nitidus</i>	0	4	0	0	0	0	5	0	0	20	56	2	0	0	0	0
<i>Euconulus fulvus</i>	1	3	0	0	0	3	0	0	0	0	5	2	4	0	0	13
<i>Euconulus alderi</i>	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
<i>Cochlodina laminata</i>	0	16	9	79	32	8	0	1	10	9	13	8	0	6	0	8
<i>Cochlodina costata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina orthostoma</i>	0	0	0	0	0	0	0	0	2	0	3	4	0	2	5	18
<i>Ruthenica filograna</i>	0	0	0	0	0	0	0	0	0	0	4	15	0	0	0	0
<i>Macrogastra ventricosa</i>	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Macrogastra latestriata</i>	0	16	16	0	6	12	0	14	9	0	12	10	6	10	0	10
<i>Macrogastra plicatula</i>	0	0	0	0	0	0	0	0	0	0	10	13	0	0	9	0
<i>Macrogastra tumida</i>	65	38	74	29	7	23	21	51	90	2	40	12	5	3	0	12
<i>Clausilia parvula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia dubia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia pumila</i>	0	0	28	0	65	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia cruciata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Laciniaria plicata</i>	0	20	9	22	15	20	0	6	10	0	18	7	0	0	0	0
<i>Alinda biplicata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea fallax</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea stabilis</i>	27	9	0	6	0	16	4	20	0	0	0	0	0	10	7	0
* <i>Vestia</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(continues)

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	S.E. Poland (b)															
	Prz	Prz	Prz	Prz	Prz	Prz	Ust	Kom	Kom	Kom	Rym	Rym	Rym	Gor	Gor	Gor
	1	2	3	4	5	6	1	1	2	3	1	2	3	1	2	3
<i>Vestia gulo</i>	12	4	12	6	25	25	10	19	31	12	36	17	10	5	11	49
<i>Vestia turgida</i>	0	0	0	36	0	0	0	0	0	0	144	16	17	6	5	0
<i>Vestia elata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bulgarica cana</i>	7	11	39	4	0	19	4	25	13	5	0	0	0	7	7	15
<i>Bradybaena fruticum</i>	0	0	70	78	93	17	55	7	0	1	10	10	0	16	11	0
<i>Perforatella bidentata</i>	0	0	0	0	23	0	0	0	0	0	84	6	2	0	0	35
<i>Perforatella dibothrion</i>	18	30	20	46	0	12	8	39	56	88	5	8	19	8	6	3
<i>Perforatella incarnata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4
<i>Perforatella vicina</i>	13	22	19	28	5	16	3	6	19	15	13	21	31	17	19	7
<i>Perforatella umbrosa</i>	0	0	0	22	21	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella rubiginosa</i>	0	0	0	0	0	0	2	0	0	0	39	0	0	0	0	0
* <i>Trochulus villosulus</i>	0	0	2	0	37	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus hispidus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus lubomirskii</i>	31	0	0	0	0	1	0	0	6	9	0	0	0	0	0	3
* <i>Trochulus bakowskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	3	8	0
* <i>Trochulus bielzi</i>	0	0	9	2	10	23	5	14	0	0	0	3	0	0	0	2
* <i>Trochulus unidentatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Euomphalia strigella</i>	43	5	14	10	0	0	0	0	3	0	0	0	0	0	0	0
<i>Helicodonta obvoluta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helicigona lapicida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Arianta arbustorum</i>	0	0	0	56	71	0	16	2	3	0	0	6	3	9	12	10
<i>Causa holosericum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chilostoma faustinum</i>	11	6	20	20	39	15	5	2	14	6	7	7	10	0	6	4
<i>Drobacia banaticum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Isognomostoma isognomostoma</i>	11	7	13	5	1	11	7	4	29	10	38	35	9	11	21	8
<i>Cepaea hortensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cepaea nemoralis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helix pomatia</i>	9	10	21	53	75	6	3	7	7	0	0	4	2	8	6	2

	Pieniny														
	Pod	Pod	Pod	Pod	Pod	Pod	Pod	Pod	Pie	Pie	Pie	Pie	Pie	Pie	Pie
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7
<i>Acicula parcelineata</i>	0	0	0	0	0	0	0	0	3	3	0	3	3	0	0
<i>Acicula polita</i>	0	0	5	0	3	4	0	0	3	5	0	0	0	2	3
* <i>Acicula perpusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carychium minimum</i>	50	0	22	0	3	39	0	0	0	0	0	0	0	4	16
<i>Carychium tridentatum</i>	40	65	63	41	71	64	42	46	133	37	19	55	45	25	74
<i>Succinea oblonga</i>	0	0	0	0	0	0	0	0	3	0	0	0	0	0	12
<i>Succinea putris</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
<i>Cochlicopa lubrica</i>	0	0	0	0	0	0	0	0	2	0	0	0	0	0	4
<i>Cochlicopa lubricella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlicopa nitens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Pyramidula pusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Columella edentula</i>	3	2	4	3	1	7	3	14	4	8	2	4	5	3	9
<i>Vertigo pusilla</i>	6	6	10	5	7	10	14	17	28	23	5	49	13	10	22
<i>Vertigo antivertigo</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vertigo substriata</i>	9	2	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vertigo alpestris</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
* <i>Sphyradium doliolum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Pagodulina pagodula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Argna bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0
<i>Vallonia costata</i>	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
<i>Vallonia pulchella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Acanthinula aculeata</i>	2	7	0	36	3	5	4	8	2	8	4	5	4	0	1
* <i>Mastus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ena montana</i>	0	1	0	2	0	4	0	2	19	22	6	23	57	9	16
<i>Ena obscura</i>	0	0	1	0	0	0	0	0	7	0	0	0	11	0	0
<i>Punctum pygmaeum</i>	10	45	75	34	81	43	73	33	75	60	45	21	53	133	74
<i>Discus ruderatus</i>	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Discus rotundatus</i>	5	3	6	5	15	1	0	0	3	11	0	4	10	0	0
<i>Discus perspectivus</i>	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0
<i>Vitrina pellucida</i>	0	0	0	0	0	3	3	3	1	6	3	4	2	1	2
<i>Semilimax semilimax</i>	0	0	0	0	0	0	4	0	1	2	1	0	0	0	0
<i>Semilimax kotulae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia diaphana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia nivalis</i>	4	3	4	8	2	3	0	3	1	4	4	1	1	3	4
<i>Vitrea diaphana</i>	4	7	6	16	14	13	11	4	13	6	2	7	10	6	5
<i>Vitrea transsylvanica</i>	2	1	0	0	0	15	4	5	2	2	2	4	0	0	0
<i>Vitrea crystallina</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
<i>Vitrea contracta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Aegopinella pura</i>	15	10	25	46	35	20	5	17	56	20	13	18	25	39	32

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	Pieniny														
	Pod	Pod	Pod	Pod	Pod	Pod	Pod	Pod	Pie	Pie	Pie	Pie	Pie	Pie	Pie
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7
<i>Aegopinella minor</i>	0	0	0	0	0	6	4	3	0	0	0	2	1	0	0
<i>Aegopinella epipedostoma</i>	5	5	2	4	9	3	0	1	10	12	9	8	15	2	2
<i>Aegopinella nitidula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Nesovitrea hammonis</i>	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0
<i>Nesovitrea petronella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus alliarius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus cellarius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus deubeli</i>	0	0	0	3	0	4	2	0	3	9	7	10	13	1	2
<i>Oxychilus draparnaudi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus glaber</i>	2	0	0	0	0	5	2	5	2	4	2	1	8	0	0
<i>Oxychilus depressus</i>	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0
<i>Daudebardia rufa</i>	0	1	0	0	0	0	3	1	0	0	0	0	0	0	0
<i>Daudebardia brevipes</i>	0	1	0	0	0	3	1	0	0	0	0	0	0	0	0
<i>Carpathica calophana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Zonitoides nitidus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Euconulus fulvus</i>	0	2	4	2	4	31	42	7	15	14	7	12	1	13	2
<i>Euconulus alderi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina laminata</i>	7	13	2	3	6	0	0	0	4	3	2	5	6	13	5
<i>Cochlodina costata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina orthostoma</i>	0	0	0	0	2	0	0	0	2	1	0	0	0	0	0
<i>Ruthenica filograna</i>	0	0	0	10	1	0	0	0	31	3	0	1	11	0	0
<i>Macrogastra ventricosa</i>	5	8	3	0	0	7	0	4	1	3	0	0	2	12	8
<i>Macrogastra latestriata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Macrogastra plicatula</i>	4	12	0	2	2	0	3	0	3	15	9	8	13	10	0
<i>Macrogastra tumida</i>	2	1	1	0	0	0	0	0	1	0	0	10	7	5	4
<i>Clausilia parvula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia dubia</i>	2	0	0	0	0	0	0	0	0	0	0	0	11	0	0
<i>Clausilia pumila</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
<i>Clausilia cruciata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Laciniaria plicata</i>	7	0	0	0	2	0	0	5	15	3	4	8	25	1	0
<i>Alinda biplicata</i>	17	3	2	2	5	5	4	3	3	0	5	0	6	12	0
<i>Balea fallax</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea stabilis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Vestia</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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	Pieniny														
	Pod	Pod	Pod	Pod	Pod	Pod	Pod	Pod	Pie	Pie	Pie	Pie	Pie	Pie	Pie
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7
<i>Vestia gulo</i>	7	10	5	0	0	11	34	6	2	3	11	6	3	8	4
<i>Vestia turgida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
<i>Vestia elata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bulgarica cana</i>	5	3	0	0	1	5	0	4	2	7	0	0	3	0	5
<i>Bradybaena fruticum</i>	0	3	0	2	0	0	3	0	5	0	0	3	0	0	14
<i>Perforatella bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella dibothrion</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella incarnata</i>	0	0	4	1	4	2	10	7	8	14	8	4	10	3	8
<i>Perforatella vicina</i>	3	1	6	0	2	0	0	0	4	9	7	6	16	19	2
<i>Perforatella umbrosa</i>	0	0	0	2	0	3	4	10	0	2	6	4	3	3	3
<i>Perforatella rubiginosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus villosulus</i>	0	0	0	1	2	0	1	0	1	0	5	1	0	0	0
* <i>Trochulus hispidus</i>	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0
* <i>Trochulus lubomirskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bakowskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus unidentatus</i>	2	1	12	6	2	3	8	8	29	11	7	7	11	11	12
<i>Euomphalia strigella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helicodonta obvoluta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helicigona lapicida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Arianta arbustorum</i>	0	0	0	0	0	0	0	6	3	9	6	7	10	6	26
<i>Causa holosericum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chilostoma faustinum</i>	7	4	2	5	5	3	6	8	11	15	11	11	29	19	4
<i>Drobacia banaticum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Isognomostoma isognomostoma</i>	11	14	5	20	8	19	19	15	35	19	5	36	25	14	27
<i>Cepaea hortensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cepaea nemoralis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helix pomatia</i>	0	2	5	7	3	2	0	0	10	3	4	1	2	12	7

	Holy Cross						Ojców						
	Hcr 1	Hcr 2	Hcr 3	Hcr 4	Hcr 5	Hcr 6	Ojc 1	Ojc 2	Ojc 3	Ojc 4	Ojc 5	Ojc 6	Ojc 7
<i>Acicula parcelineata</i>	0	0	0	0	0	0	1	3	6	0	2	0	2
<i>Acicula polita</i>	0	0	0	0	0	0	2	14	2	2	3	4	5
* <i>Acicula perpusilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Carychium minimum</i>	0	3	39	0	0	0	0	0	0	0	0	0	0
<i>Carychium tridentatum</i>	3	4	12	4	7	117	322	724	157	174	464	242	249
<i>Succinea oblonga</i>	0	0	0	0	1	0	0	0	0	0	0	0	0
<i>Succinea putris</i>	3	1	11	3	3	0	0	0	0	0	0	0	0
<i>Cochlicopa lubrica</i>	4	12	38	10	4	9	12	10	3	3	2	0	0
<i>Cochlicopa lubricella</i>	0	0	0	9	0	0	0	0	0	0	0	0	0
<i>Cochlicopa nitens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Pyramidula pusilla</i>	0	0	0	0	0	0	0	23	3	49	49	34	66
<i>Columella edentula</i>	31	4	203	28	95	44	2	19	3	6	11	12	2
<i>Vertigo pusilla</i>	6	0	9	4	11	4	65	13	44	27	112	26	54
<i>Vertigo antivertigo</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vertigo substriata</i>	2	2	15	0	0	2	0	0	0	0	0	0	0
<i>Vertigo alpestris</i>	0	0	0	0	0	1	3	2	3	6	2	3	1
* <i>Sphyradium doliolum</i>	0	0	0	0	0	0	0	2	0	31	9	0	16
<i>Pagodulina pagodula</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Argna bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vallonia costata</i>	0	0	0	19	0	0	2	12	4	16	14	43	18
<i>Vallonia pulchella</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Acanthinula aculeata</i>	6	3	0	0	18	3	2	2	2	2	0	3	7
* <i>Mastus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Ena montana</i>	0	0	0	0	0	7	4	0	5	32	10	14	12
<i>Ena obscura</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Punctum pygmaeum</i>	1	5	22	140	7	3	112	123	168	143	99	124	185
<i>Discus ruderatus</i>	4	0	0	0	0	2	0	0	0	0	0	0	0
<i>Discus rotundatus</i>	4	0	0	0	0	4	32	30	6	4	23	13	3
<i>Discus perspectivus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrina pellucida</i>	25	4	8	7	54	60	4	3	2	2	3	1	4
<i>Semilimax semilimax</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Semilimax kotulae</i>	4	0	0	0	0	3	0	0	0	0	0	0	0
<i>Eucobresia diaphana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Eucobresia nivalis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea diaphana</i>	0	0	0	0	0	0	11	5	16	8	5	6	3
<i>Vitrea transsylvanica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vitrea crystallina</i>	9	13	0	0	0	12	19	16	10	3	10	1	12
<i>Vitrea contracta</i>	0	0	0	0	0	0	0	4	7	9	4	2	4
<i>Aegopinella pura</i>	9	12	0	4	25	61	38	64	24	7	32	51	32

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	Holy Cross						Ojców						
	Hcr 1	Hcr 2	Hcr 3	Hcr 4	Hcr 5	Hcr 6	Ojc 1	Ojc 2	Ojc 3	Ojc 4	Ojc 5	Ojc 6	Ojc 7
<i>Aegopinella minor</i>	0	0	0	4	14	3	3	4	4	4	3	2	6
<i>Aegopinella epipedostoma</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Aegopinella nitidula</i>	0	0	0	0	0	0	4	3	2	0	1	0	3
<i>Nesovitrea hammonis</i>	45	36	54	14	17	14	1	0	1	0	0	0	0
<i>Nesovitrea petronella</i>	11	39	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus alliarius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus cellarius</i>	0	1	0	0	0	15	0	0	0	0	0	0	0
<i>Oxychilus deubeli</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus draparnaudi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Oxychilus glaber</i>	0	0	0	0	0	0	0	1	0	2	0	2	2
<i>Oxychilus depressus</i>	0	0	0	0	0	0	2	2	0	2	0	0	3
<i>Daudebardia rufa</i>	0	0	0	0	0	0	0	0	2	0	0	0	0
<i>Daudebardia brevipes</i>	0	0	0	0	0	0	1	0	1	0	0	0	0
<i>Carpathica calophana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Zonitoides nitidus</i>	8	40	49	0	13	0	0	0	0	0	0	0	0
<i>Euconulus fulvus</i>	11	14	7	0	4	40	31	11	10	3	6	11	5
<i>Euconulus alderi</i>	0	0	2	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina laminata</i>	0	0	0	37	89	15	14	11	46	15	19	18	23
<i>Cochlodina costata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cochlodina orthostoma</i>	0	0	0	0	0	0	5	5	4	6	3	4	29
<i>Ruthenica filograna</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Macrogastra ventricosa</i>	0	0	0	0	0	0	1	6	4	0	13	2	3
<i>Macrogastra latestriata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Macrogastra plicatula</i>	0	0	0	0	0	0	24	13	5	3	0	18	9
<i>Macrogastra tumida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia parvula</i>	0	0	0	0	0	0	2	2	0	12	11	9	6
<i>Clausilia dubia</i>	0	0	0	0	0	6	11	10	3	7	17	9	28
<i>Clausilia pumila</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia cruciata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Clausilia bidentata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Laciniaria plicata</i>	0	0	0	18	0	0	0	0	0	0	0	0	0
<i>Alinda biplicata</i>	0	0	0	0	0	77	34	49	113	133	62	86	64
<i>Balea fallax</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Balea stabilis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Vestia</i> sp.	0	0	0	0	0	0	0	0	0	0	0	0	0

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	Holy Cross						Ojców						
	Hcr 1	Hcr 2	Hcr 3	Hcr 4	Hcr 5	Hcr 6	Ojc 1	Ojc 2	Ojc 3	Ojc 4	Ojc 5	Ojc 6	Ojc 7
<i>Vestia gulo</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vestia turgida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Vestia elata</i>	0	0	0	0	0	134	0	0	0	0	0	0	0
<i>Bulgarica cana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bradybaena fruticum</i>	0	0	0	65	47	0	0	0	0	0	0	0	0
<i>Perforatella bidentata</i>	19	0	21	0	16	0	0	0	0	0	0	0	0
<i>Perforatella dibothrion</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Perforatella incarnata</i>	50	6	20	0	93	17	7	6	30	22	13	34	25
<i>Perforatella vicina</i>	0	0	0	0	0	0	9	3	47	38	45	23	8
<i>Perforatella umbrosa</i>	0	0	0	0	0	0	0	1	7	23	8	4	10
<i>Perforatella rubiginosa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus villosulus</i>	0	0	0	0	0	0	31	9	0	0	0	1	12
* <i>Trochulus hispidus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus lubomirskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bakowskii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus bielzi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
* <i>Trochulus unidentatus</i>	0	0	0	0	0	0	9	20	14	24	19	17	22
<i>Euomphalia strigella</i>	0	0	0	10	14	0	0	0	0	0	0	0	0
<i>Helicodonta obvoluta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helicigona lapicida</i>	0	0	0	0	0	0	1	0	2	1	2	0	1
<i>Arianta arbustorum</i>	0	0	0	0	38	0	0	0	0	0	0	0	0
<i>Causa holosericum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chilostoma faustinum</i>	0	0	0	0	0	0	14	9	26	70	42	40	64
<i>Drobacia banaticum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Isognomostoma isognomostoma</i>	0	0	0	0	0	0	25	13	18	30	23	20	13
<i>Cepaea hortensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	2
<i>Cepaea nemoralis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Helix pomatia</i>	0	0	0	0	12	3	0	0	0	4	4	0	0

APPENDIX 3

TABLE 1. DCA of 161 sites based on all species. Spearman's correlation coefficients between explanatory variables and sites scores on the first four axes. Correlations with species richness and abundances are also shown. Values of Spearman correlation coefficient (r_s) and significance probabilities (P) are shown. Significant correlations after Bonferroni correction are in bold (the cut level was $P = 0.0014$). Whitney U test was used for testing relationships between nominal variables and sites scores on the DCA axes. Significant relationships ($P = 0.05$) are in bold. Eigenvalues: 1st axis 0.332, 2nd axis 0.132, 3rd axis 0.082, 4th axis 0.060. Percentage variance of the species data explained: 1st axis 16.9%, 2nd axis 6.7%, 3rd axis 4.2%, 4th axis 3.0%.

Continuous and ordinal	DCA1		DCA2		DCA3		DCA4	
	r_s	P	r_s	P	r_s	P	r_s	P
Environment								
Rock	0.39	<0.001	-0.53	<0.001	0.36	<0.001	0.37	<0.001
Limestone	0.35	<0.001	-0.44	<0.001	0.27	<0.001	0.13	0.110
Slope	0.56	<0.001	-0.31	<0.001	0.20	0.009	0.22	0.005
Wet	-0.27	<0.001	0.29	<0.001	-0.35	<0.001	-0.13	0.097
Disturbance	0.03	0.740	0.03	0.730	-0.28	<0.001	-0.03	0.714
Conifers	-0.42	<0.001	0.29	<0.001	0.04	0.642	-0.10	0.227
Beech	0.51	<0.001	-0.32	<0.001	0.36	<0.001	-0.04	0.597
Mixed deciduous wood	-0.11	0.159	-0.24	0.003	-0.32	<0.001	0.00	0.973
Alder/Willow	-0.30	<0.001	0.28	<0.001	-0.42	<0.001	-0.12	0.143
Ash	0.00	0.954	0.04	0.628	-0.34	<0.001	0.05	0.518
Wet indicator herbs	0.08	0.318	0.40	<0.001	-0.25	<0.001	0.05	0.552
Dog's mercury	-0.07	0.385	-0.55	<0.001	0.09	0.257	0.21	0.007
Rich indicator herbs	-0.04	0.607	-0.51	<0.001	0.08	0.285	0.01	0.923
Acid indicator herbs combination	-0.13	0.104	0.30	<0.001	0.07	0.382	-0.08	0.320
Altitude	0.67	<0.001	-0.08	0.311	0.29	<0.001	0.42	<0.001
Wet combination	-0.22	0.005	0.33	<0.001	-0.44	<0.001	-0.11	0.179
Rich combination	0.11	0.180	-0.65	<0.001	0.05	0.515	0.19	0.017
Poor combination	0.16	0.046	0.03	0.735	0.38	<0.001	-0.12	0.129
Climate								
Mean Annual Temp.	0.03	0.686	0.07	0.353	-0.01	0.932	-0.09	0.264
Max. Temp. Warm. Month	-0.01	0.885	0.41	<0.001	-0.03	0.682	-0.22	0.004
Min. Temp. Cold. Month	-0.47	<0.001	-0.36	<0.001	0.01	0.942	-0.05	0.561
Annual Precipitation	0.74	<0.001	-0.09	0.253	0.29	<0.001	0.27	<0.001
Precip. Sean. CV	0.31	<0.001	-0.31	<0.001	0.02	0.768	0.48	<0.001
Space								
Latitude	-0.89	<0.001	-0.02	0.830	-0.21	0.008	-0.13	0.089
Longitude	0.06	0.482	0.67	<0.001	0.18	0.025	-0.56	<0.001
Lat.*Long.	-0.13	0.109	0.71	<0.001	0.09	0.280	-0.54	<0.001
Lat.*Lat.	-0.89	<0.001	-0.02	0.830	-0.21	0.008	-0.13	0.089
Long.*Long.	0.06	0.482	0.67	<0.001	0.18	0.025	-0.56	<0.001
Lat.*Lat.*Long.	-0.24	0.002	0.64	<0.001	0.01	0.955	-0.60	<0.001
Lat.*Long.*Long.	-0.07	0.369	0.69	<0.001	0.13	0.114	-0.53	<0.001
Lat.*Lat.*Lat	-0.89	<0.001	-0.02	0.830	-0.21	0.008	-0.13	0.089
Long.*Long.*Long.	0.06	0.482	0.67	<0.001	0.18	0.025	-0.56	<0.001
No. Individuals	-0.09	0.242	-0.15	0.055	-0.23	0.003	0.11	0.178
No. Species	0.34	<0.001	-0.12	0.127	-0.11	0.162	0.15	0.061

(continues)

(continued)

Nominal (P values)	DCA1	DCA2	DCA3	DCA4
Environment				
Stream	0.238	0.515	0.143	0.068
Timber	0.437	0.154	0.799	0.910
Bare	0.011	0.556	0.001	0.915

TABLE 2. DCA of 161 sites based on large species. Spearman's correlation coefficients between explanatory variables and sites scores on the first four axes for continuous and ordinal variables. Values of Spearman correlation coefficient (r_s) and significance probabilities (P) are shown. Significant correlations after Bonferroni correction are in bold (the cut level was $P = 0.0014$). Whitney U test was used for testing relationships between nominal variables and sites scores on the DCA axes. Values of $P < 0.05$ in bold. Eigenvalues: 1st axis 0.443, 2nd axis 0.165, 3rd axis 0.101, 4th axis 0.088. Percentage variance of the species data explained: 1st axis 16.6%, 2nd axis 6.1%, 3rd axis 3.8%, 4th axis 3.3%.

Continuous and ordinal	DCA1		DCA2		DCA3		DCA4	
	r_s	P	r_s	P	r_s	P	r_s	P
Environment								
Rock	0.36	<0.001	0.68	<0.001	0.19	0.013	0.19	0.014
Limestone	0.34	<0.001	0.43	<0.001	0.15	0.056	0.17	0.027
Slope	0.55	<0.001	0.42	<0.001	0.23	0.004	0.01	0.876
Wet	-0.27	<0.001	-0.39	<0.001	-0.37	<0.001	-0.08	0.291
Disturbance	0.02	0.819	-0.06	0.436	-0.04	0.578	-0.24	0.003
Conifers	-0.41	<0.001	-0.31	<0.001	-0.13	0.109	0.19	0.017
Bee	0.49	<0.001	0.37	<0.001	0.36	<0.001	0.05	0.530
mdw	-0.17	0.030	0.05	0.564	-0.21	0.009	-0.33	<0.001
aldwil	-0.29	<0.001	-0.42	<0.001	-0.40	<0.001	-0.12	0.126
Ash	0.01	0.992	-0.14	0.078	-0.26	<0.001	-0.13	0.103
weth	0.12	0.127	-0.30	<0.001	-0.23	0.003	0.09	0.232
dogsm	-0.14	0.079	0.46	<0.001	-0.12	0.128	-0.05	0.570
richh	-0.11	0.156	0.38	<0.001	0.09	0.278	-0.13	0.089
acidh	-0.11	0.146	-0.24	0.002	0.07	0.401	0.05	0.568
Altitude	0.69	<0.001	0.40	<0.001	0.17	0.030	0.23	0.004
Wet combination	-0.22	0.006	-0.43	<0.001	-0.44	<0.001	-0.08	0.286
Rich combination	0.03	0.715	0.53	<0.001	-0.04	0.598	-0.09	0.254
Poor combination	0.16	0.043	0.04	0.659	0.26	<0.001	0.19	0.014
Climate								
Mean Annual Temp.	0.08	0.326	-0.10	0.207	0.18	0.024	-0.05	0.489
Max. Temp. Warm. Month	0.09	0.264	-0.42	<0.001	0.22	0.005	0.07	0.362
Min. Temp. Cold. Month	-0.54	<0.001	0.22	0.006	-0.07	0.370	-0.12	0.140
Annual Precipitation	0.73	<0.001	0.33	<0.001	0.13	0.110	0.33	<0.001
Precip. Sean. CV	0.27	<0.001	0.49	<0.001	-0.02	0.845	-0.09	0.235

(continues)

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Space								
Latitude	-0.90	<0.001	-0.18	0.023	-0.18	0.021	-0.17	0.035
Longitude	0.17	0.030	-0.72	<0.001	0.26	<0.001	0.30	<0.001
Lat.*Long.	-0.01	0.878	-0.78	<0.001	0.19	0.014	0.27	<0.001
Lat.*Lat.	-0.90	<0.001	-0.18	0.023	-0.18	0.021	-0.17	0.035
Long.*Long.	0.17	0.030	-0.72	<0.001	0.26	<0.001	0.30	<0.001
Lat.*Lat.*Long.	-0.15	0.055	-0.78	<0.001	0.11	0.161	0.17	0.033
Lat.*Long.*Long.	0.05	0.554	-0.75	<0.001	0.21	0.007	0.32	<0.001
Lat.*Lat.*Lat	-0.90	<0.001	-0.18	0.023	-0.18	0.021	-0.17	0.035
Long.*Long.*Long.	0.17	0.030	-0.72	<0.001	0.26	<0.001	0.30	<0.001
Nominal (P values)	DCA1	DCA2	DCA3	DCA4				
Environment								
Stream	0.467	0.643	0.045	0.327				
Timber	0.257	0.460	0.360	0.931				
Bare	0.006	0.079	<0.001	0.090				

TABLE 3. DCA of 161 sites based on small species. Spearman's correlation coefficients between explanatory variables and sites scores on the first four axes for continuous and ordinal variables. Values of Spearman correlation coefficient (r_s) and significance probabilities (P) are shown. Significant correlations after Bonferroni correction are in bold (the cut level was $P = 0.0014$). Whitney U test was used for testing relationships between nominal variables and sites scores on the DCA axes. Values of $P < 0.05$ in bold. Eigenvalues: 1st axis 0.218, 2nd axis 0.085, 3rd axis 0.060, 4th axis 0.049. Percentage variance of the species data explained: 1st axis 22.2%, 2nd axis 8.5%, 3rd axis 6.8%, 4th axis 5.0%.

Continuous and ordinal	DCA1		DCA2		DCA3		DCA4	
	r_s	P	r_s	P	r_s	P	r_s	P
Environment								
Rock	0.44	<0.001	-0.01	0.921	0.31	<0.001	-0.01	0.875
Limestone	0.40	<0.001	-0.08	0.339	0.10	0.215	0.17	0.028
Slope	0.51	<0.001	0.10	0.223	0.46	<0.001	-0.05	0.542
Wet	-0.30	<0.001	0.06	0.465	-0.20	0.011	0.07	0.362
Disturbance	-0.02	0.764	0.08	0.296	0.06	0.469	0.02	0.756
Conifers	-0.39	<0.001	-0.11	0.163	-0.18	0.022	-0.11	0.181
Bee	0.50	<0.001	0.08	0.311	0.18	0.022	0.01	0.937
mdw	0.05	0.532	-0.24	0.003	-0.04	0.601	0.01	0.861
aldwil	-0.29	<0.001	0.03	0.679	-0.21	0.007	0.10	0.216
Ash	-0.01	0.910	0.05	0.541	-0.13	0.101	0.21	0.007
weth	-0.12	0.117	0.32	<0.001	0.04	0.641	0.14	0.075
dogsm	0.16	0.044	-0.39	<0.001	-0.08	0.293	0.01	0.876
richh	0.15	0.059	-0.30	<0.001	-0.16	0.048	0.04	0.615
acidh	-0.17	0.030	0.05	0.549	0.05	0.517	-0.11	0.180
Altitude	0.45	<0.001	0.47	<0.001	0.41	<0.001	-0.12	0.137

(continues)

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Wet combination	-0.26	<0.001	0.11	0.176	-0.20	0.011	0.13	0.090
Rich combination	0.31	<0.001	-0.29	<0.001	-0.04	0.604	0.08	0.288
Poor combination	0.14	0.087	0.03	0.665	0.05	0.538	-0.08	0.332
Climate								
Mean Annual Temp.	0.01	0.882	-0.11	0.160	-0.01	0.888	0.20	0.010
Max. Temp. Warm. Month	-0.13	0.089	0.05	0.539	0.03	0.707	0.19	0.017
Min. Temp. Cold. Month	-0.20	0.010	-0.46	<0.001	-0.28	<0.001	0.11	0.147
Annual Precipitation	0.56	<0.001	0.48	<0.001	0.46	<0.001	-0.10	0.205
Precip. Sean. CV	0.28	<0.001	0.09	0.275	0.19	0.016	0.01	0.914
Space								
Latitude	-0.69	<0.001	-0.53	<0.001	-0.41	<0.001	-0.05	0.530
Longitude	-0.12	0.125	0.08	0.298	-0.02	0.759	0.12	0.143
Lat.*Long.	-0.29	<0.001	0.01	0.883	-0.07	0.360	0.08	0.318
Lat.*Lat.	-0.69	<0.001	-0.53	<0.001	-0.41	<0.001	-0.05	0.530
Long.*Long.	-0.12	0.125	0.08	0.298	-0.02	0.759	0.12	0.143
Lat.*Lat.*Long.	-0.34	<0.001	-0.09	0.241	-0.17	0.034	0.07	0.378
Lat.*Long.*Long.	-0.24	0.003	0.03	0.723	-0.05	0.506	0.11	0.177
Lat.*Lat.*Lat	-0.69	<0.001	-0.53	<0.001	-0.41	<0.001	-0.05	0.530
Long.*Long.*Long.	-0.12	0.125	0.08	0.298	-0.02	0.759	0.12	0.143
Nominal (P values)					DCA1	DCA2	DCA3	DCA4
Environment								
Stream	0.067	0.035	0.665	0.814				
Timber	0.767	0.962	0.147	0.569				
Bare	0.029	0.049	0.019	0.063				

TABLE 4. Results of partitioning variation using partial CCAs and Monte Carlo permutation test with 1999 runs. In each group only the five most powerful predictors were chosen (based on separated CCAs, forward selection and MC test for each group of variables). All were significant - MC test. The right section shows the independent variation for each group, i.e. variation explained when other two groups of variables were used as covariables. AnnPrec, annual precipitation; PrecSeas, coefficient of variation in seasonal precipitation, MaxTemWa, maximum temperature in warmest month, MeanAnnTemp, mean annual temperature; MinTempCo, minimum temperature in coldest month.

Geography	All variation explained		Independent variation	
	Order in Forward selection	%	Order in Forward selection	%
Latitude	1	9.9	1	3.0
Longitude	2	6.1	3	3.5
Lat*Long	3	5.6	4	2.2
Lat*Lat	4	3.4	2	1.7
Long*Long*Long	5	2.7	5	0.9
total		27.2		11.3

Climate	All variation explained		Independent variation	
	Order in Forward selection	%	Order in Forward selection	%
AnnPrec	1	7.9	3	1.8
PrecSeas	2	4.0	1	1.4
MaxTemWa	3	3.9	4	0.9
MeanAnnTemp	4	3.3	5	0.9
MinTempCo	5	2.0	2	1.1
total		21.2		6.0

Environment	All variation explained		Independent variation	
	Order in Forward selection	%	Order in Forward selection	%
Altitude	1	6.8	2	1.7
Rock	2	4.6	1	1.3
Beech	3	2.0	4	1.3
Lime	4	1.8	3	0.7
Dogs Mercury	5	1.8	5	0.6
total		17.1		5.6